LWG COMMENTS ON EPA'S DECEMBER 19, 2014, FEASIBILITY STUDY PROPOSED FINAL DRAFT SECTION 1

EPA provided a draft of Section 1 of its revised Feasibility Study on July 8, 2014 and engaged in technical discussions with the LWG that concluded on August 29, 2014. On that date the LWG submitted to EPA a letter and attachments that included a list of concerns related to EPA's Section 1, along with a redline-strikeout set of suggested edits to Section 1. On December 18, 2014, EPA provided the proposed final draft of Section 1 of the revised FS to the LWG. It appears EPA did not address most, if any, of the LWG's stated concerns or incorporate its suggested edits into the December 18 proposed final draft Section 1.

EPA did not provide a written response to the LWG's August 29, 2014 comments and indicated by telephone on December 19 that further technical discussion was unnecessary, because the LWG's concerns were fully vetted during the original review period. Consistent with the December 17, 2014 revisions to the FS Revision Process Agreement, we understand that EPA is not directing the LWG to incorporate its revisions to Section 1 or make other modifications or changes to the draft FS at this time. Therefore, neither the delivery of EPA's December 18 revisions to FS Section 1 nor the expiration of the 15 day technical resolution period trigger any deadline for the initiation of dispute resolution.

The LWG requests that EPA address its comments into the final revisions to FS Section 1. To provide a clear record in the absence of any technical discussions following delivery of EPA's December 18 draft, the LWG reiterates its August 29, 2014, significant concerns with EPA's "streamlined" Section 1. It is the LWG's position that the deleted information discussed below provides necessary support, both scientific and legal, for EPA's remedy selection. Removal of the content is contrary to EPA guidance and practice. *See, e.g.*, Lower Duwamish River Feasibility Study Sections 2.1 (Environmental Setting), Section 2.3 (Conceptual Site Model), and Section 2.4 (Source Control Strategy).

1 – DELETION OF CONCEPTUAL SITE MODEL

Although EPA retained some references to a few conceptual site model (CSM) fate and transport processes, the bulk of the Draft FS CSM description was removed. Critical CSM information for FS alternative development and evaluation that was removed includes:

1) Physical factors and processes (e.g., descriptions of bathymetry, deposition/erosion, debris, substrate types, and shoreline conditions).
2) Site uses (e.g., channel and maintenance dredging areas).
3) Human activities (e.g., vessel traffic patterns, propwash, and historical remediation).
4) Chemical distributions (e.g., subsurface contamination figures, biota tissue chemical concentrations, transition zone water [TZW] concentrations).
5) Biological habitats and restoration sites.
6) Site sources (e.g., details in Appendix Q).

7) Potential risks (e.g., summaries of certain scenarios and receptors are missing).
8) A thorough presentation and discussion of fate and transport processes.

EPA's CSM relies almost entirely on a schematic from the 2012 Draft FS, which is insufficient to convey the existence and interplay of these various CSM factors (as compared to the detailed CSM maps in 2012 Draft FS Figure 2.6-2, which EPA deleted). In addition, EPA's CSM discussion does not refer the reader to the location of this information either in the RI, later in the FS, or someplace else. Adding a reference to the RI CSM will not fully address this problem because some aspects of the FS CSM are not discussed extensively in the RI, including extent of in-water debris, vessel traffic patterns, prop wash, historical remediation, habitat restoration sites, updated source information, and fate and transport modeling elements.

The inclusion in the FS of the CSM information noted above and identified in the LWG's August 29th detailed comments on Section 1 is necessary to provide a foundation and rationale for many later discussions in the FS and ultimately for the evaluation and selection of a remedial alternative. A few obvious examples of their necessity include the following:

1) Descriptions of bathymetry and deposition/erosion are needed to understand how potential remedial technologies might apply to various areas of the Site.
2) Identification of site uses as they relate to navigation is critical to explaining why dredging versus in situ technologies may be more prudent in particular areas.
3) Identification of current and potential future human activities similarly is critical to evaluating remedial technologies, such as dredging and capping.
4) An understanding of subsurface contaminant, tissue and TZW concentrations (at an FS-level of detail) is essential to defining volumes for alternatives. Also, concentrations in tissue relate to bioaccumulation risks that the alternatives need to indirectly address, and concentrations in TZW relate to the potential effectiveness of capping.
5) Biological habitat information is critical to assessing the potential habitat impacts of each alternative and the potential need for mitigation. EPA specifically instructed the LWG to include habitat information in the 2012 Draft FS, yet did not include it in its own draft FS.
6) Details of site sources are needed to understand the relationship between in-water alternatives in each sediment management area and potential ongoing upland sources that, if not controlled, could recontaminate sediment.
7) A full understanding of potential risks identified in the baseline risk assessments is needed in order to ensure that alternatives are developed and evaluated with regard to reduction of those potential risks.
8) A thorough understanding of fate and transport processes supports FS discussions of source impacts, recontamination, monitored natural recovery (MNR) and enhanced monitored natural recovery (EMNR) effectiveness, capping effectiveness, dredge releases, and remedy effects on bioaccumulation risks.

EPA has indicated during FS Section 1 discussions that many of these factors will be discussed later in the FS where these issues arise. EPA has not provided the LWG any indication as to where or how it intends to relocate this information, so the LWG cannot assess whether these issues will be adequately addressed elsewhere.

Finally, the deletion of most CSM components from the FS is especially problematic given the fact that we are still negotiating modifications to the CSM presentation in the revised RI (i.e., Section 10). EPA's sediment guidance is clear that all of the elements of the CSM discussed above must be understood to support the FS. (EPA 2005) Specifically, the sediment guidance provides a detailed description of the CSM elements necessary to support alternatives evaluation in the FS as well as a strong preference that CSM information be "summarized … in one place." EPA (2005).

2 – DELETION OF SEDIMENT/WATER BACKGROUND

EPA removed all descriptions of background conditions. Background conditions must be summarized in Section 1 to support the later FS discussion of primary remediation guidance concepts related to background. These guidance concepts include, but are not limited to, the following: 1) EPA typically does not set cleanup levels below background concentrations (EPA 2002a); and 2) Remedial Action Objectives (RAOs) should reflect objectives that are achievable from the site cleanup (EPA 2005), and remediation below background is not an achievable objective. EPA guidance is also clear that establishing background conditions is vital to the CSM (EPA 1988, 2005).

EPA has indicated that sediment background (at least as a broad concept) will be used in preliminary remediation goal (PRG) selection for some contaminants of concern in Section 2 and in alternative evaluations in Section 4. The LWG is currently in formal dispute resolution with EPA concerning EPA's selection of a single set of upriver sediment background values for the RI, which presumably EPA intends to carry forward into the FS for various purposes (e.g., PRG development, equilibrium assessment, alternatives development, and detailed evaluations of alternatives). For the reasons stated in the Request for Dispute Resolution submitted by the LWG on August 26, 2014, the values identified in Table 7.3-1b (and the related Appendix H Table H-2b) of the RI Section 7 revision agreed to by EPA and the LWG on December 12, 2013 should be the values carried forward into the FS. The FS must include some description of this concept to support these later uses of background. Similar to the CSM issue, to the extent that EPA intends to address background later in the FS, this approach will likely result in disjointed textual tangents on fundamental site-specific concepts.

Also, based on PRG tables provided by EPA up through August 6, 2014, it appears that EPA is establishing surface water and TZW PRGs (which LWG believes are inappropriate for this Site). If so, background values for surface water and TZW are needed so that cleanup levels are not set below background and are achievable per EPA guidance (EPA 2002a, 2005). In many cases, it is likely that the surface water and TZW PRGs EPA provided to the LWG will not be technically

Do Not Quote or Cite
This document is currently under review by US EPA and its federal, state and tribal partners, and is subject to change in whole or part

.

practicable to achieve due to ongoing upstream contributions, or groundwater sources that will not be addressed by the anticipated sediment remedy. EPA has indicated the Agency would consider technical impracticability during the post-remedy long-term monitoring phase. Again, this is inconsistent with the National Contingency Plan, which requires consideration of technical impracticability in remedy selection, as well as with guidance that states the RAOs and cleanup goals need to be achievable. 40 C.F.R. §300.430(f)(1)(ii)(C)(3); (EPA 2002a, 2005).

EPA indicated during the FS technical discussions that there were insufficient site data in surface water and TZW to develop background levels in these media. The LWG disagrees. There are sufficient site data to establish background for surface water, and literature data can be used to establish TZW background levels using methods detailed in our June 19, 2014 comments.

3 – SOURCE ISSUES

The summary of sources in the draft revised FS Section 1 is both factually inaccurate and much less clear than the 2012 Draft FS.

Deletion of Source Control Inventory and Status – EPA removed the summary of the source control inventory and status information and any reference to the detailed inventory in Appendix Q that EPA previously directed the LWG to include in the Draft FS. As EPA noted in its November 23, 2010 letter to the LWG, the tables were intended to "provide a status of ongoing, or potentially ongoing, upland and overwater sources to Portland Harbor in order to support the potential recontamination assessment in the FS." This is critical information for the Revised FS, and it was prepared consistent with the most recent Oregon Department of Environmental Quality (DEQ) Milestone Report for Upland Source Control available at the time.

EPA indicated during the informal discussions on Section 1 in July/August 2014 that its revised text was reviewed by the EPA lead on source control and by DEQ representatives and that the text is consistent with the Source Control Summary Report subsequently issued by DEQ in November 2014. The LWG will need time to verify the site-specific information contained in the DEQ Source Control Report, and then compare it to EPA's modified text in FS Section 1. As stated in our August 29th letter to EPA, Northwest Pipe's August 22, 2014 letter demanding retraction of EPA's text under implicit threat of legal action perfectly demonstrates why the LWG cannot agree to include statements about non-LWG PRPs in an LWG-authored document where those statements cannot be verified against any existing reference. The fact that EPA immediately deleted all reference to Northwest Pipe as a potential groundwater source on the basis of Northwest Pipe's letter alone illustrates inconsistencies in selecting source information to include or exclude from the FS.

The source control information provides important context for the FS, and also supports EPA's prior issuance of general notice letters for the site and future issuance of special notice letters. The LWG will be reviewing the source control information in FS Section 1 against the DEQ's November 2014 Source Control Report and other available documentation as part of our evaluation of EPA's final FS.

Do Not Quote or Cite
This document is currently under review by US EPA and its federal, state and tribal partners, and is subject to change in whole or part

.

Inclusion of New Upland Groundwater Plume and Riverbank Contamination Text – The LWG has three major concerns regarding this text. First, the information lacks clarity and accuracy because EPA does not cite the information sources upon which it relied, does not explain the relationship between potential upland sources and within Site conditions, and includes significant factual errors with regard to many of the upland sites discussed. EPA's new text replaces the source control inventory information, which was clearly based on and consistent with the DEQ Milestone Report and DEQ's findings regarding the potential for upland sources to impact the Site.

Second, EPA presents this new information in the Site Nature and Extent section, even though this information pertains to upland sources that will not be addressed through the in-water remedies evaluated in the FS. Although EPA notes that groundwater information may impact capping decisions[1], most of the information appears irrelevant to actual conditions and potential sediment remediation within the Site boundary and is not linked to known data on Site conditions.

Third, on August 25, EPA indicated that bank erosion remedies up to the top of the bank will be included and evaluated in the FS, and the most recent Section 1 text states that "Bank conditions are summarized because EPA may include some bank areas above elevation 13.3 feet NAVD88 within the Portland Harbor Site based on future site-specific determinations." An important FS assumption is that sources, including bank erosion, will be controlled under the DEQ program at the time of the sediment remedy (EPA 2002b). EPA and DEQ have had a long-standing agreement to limit the lateral extent of the Study Area to an elevation of 13.3 North American Vertical Datum of 1988 (NAVD88), and it is critical to maintain this boundary since the RI (including the CSM and risk assessments) was developed with that boundary in mind. *"Upland" versus "In-water" Definition and Portland Harbor Elevation Datums*, (DEQ, July 9, 2003). Therefore the 13.3 NAVD88 boundary should be retained and utilized in the FS, and upland source control actions and remedies should not be evaluated in the FS.

Deletion of Stormwater Sources – Although EPA's new text in Section 1.2.3 extensively discusses groundwater and river bank sources, stormwater sources receive no similar discussion. There needs to be a balanced presentation of all sources in Section 1. Per the previous comments, this should be achieved by placing source information in a clearly marked source control subsection and using information from the Draft FS, with updates on source control status added where necessary.

[1] It is unclear why EPA is focusing only on capping when discussing the relevance of upland groundwater plumes in Section 1. Uncontrolled groundwater plumes that discharge unacceptable concentrations into the river will likely have greater implications for the effectiveness (or lack thereof) of dredge remedies, because no provision to control such discharges (e.g., via caps) is provided by dredge remedies.

4 – EARLY ACTION DATA

EPA's draft Section 1 text indicates that early action data are included in the Revised FS. As noted in the LWG's July 9, 2014 Draft LWG Responses to EPA's Proposed Dredge Depth Approach, EPA's plan for including early action datasets in various FS evaluations is currently unknown. For example, EPA's Section 1 draft proposes to use RI figures that clearly do not include the early action data. The LWG is concerned that without a detailed data plan, it will be difficult to understand the following: 1) which evaluations are using the original FS database and which are using additional early action datasets; and 2) whether differences in various evaluation conclusions in the Draft RI, Draft FS and Revised FS are the result of database differences versus technical issues.

On August 25, EPA requested that LWG prepare a new Section 1.3 that documents the FS sediment database and includes a modified Appendix R from the Draft FS that described the database rules. The LWG provided this to EPA on September 17. This subsection documents the current contents of the FS database; however, the EPA current plan for data uses within the FS is not currently understood by LWG, and the issues raised above regarding the need for a detailed data plan still stand.

5 – INCOMPLETE RISK ASSESSMENT SUMMARIES

The risk assessment summaries in the current EPA draft lack context and, therefore, do not accurately convey risk assessment conclusions. Regarding human health, for example, there is no discussion of any exposure scenarios other than fish consumption, and more information is needed to help the reader understand the infant scenario. Regarding ecological risks, for example, the stand alone statements presented by EPA misrepresent risk conclusions absent more explanation. The few points presented are not necessarily useful for making risk management decisions in the FS, and none of the important considerations behind the conclusions addressed in the Baseline Ecological Risk Assessment uncertainty sections are discussed. Attachment 1 of the LWG's August 29 letter provides specific redline edits that address the LWG's concerns regarding these summaries.

REFERENCES

EPA (U.S. Environmental Protection Agency). 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. Interim Final. EPA/540/G-89/004. OSWER Directive 9355.3-01. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, DC.

EPA (U.S. Environmental Protection Agency), 2002a. Transmittal of Policy Statement: "Role of Background in the CERCLA Cleanup Program." From Michael B. Cook, Director of Office of Emergency and Remedial Response to Superfund National Policy Managers Regions 1 – 10. OSWER 9285.6-07P. May 1, 2002, Washington, D.C.

.

EPA. 2002b. Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, DC. OSWER Directive 9285.6-08. February.

EPA, 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites. EPA 540-R-05-102. OSWER 9355.0-85. December 2005. Washington, D.C.

002402/00192/6109166v1

LWG
LOWER WILLAMETTE GROUP

Chairperson: Bob Wyatt, NW Natural
Treasurer: Frederick Wolf, DBA, Legacy Site Services for Arkema

June 19, 2014

Kristine Koch
U.S. Environmental Protection Agency, Region 10
1200 Sixth Avenue, Suite 900, M/S ECL-115
Seattle, Washington 98101-3140

Re: LWG Comments on Revised FS Section 2 (Lower Willamette River, Portland Harbor Superfund Site, USEPA Docket No: CERCLA-10-2001-0240)

Dear Ms. Koch:

The Lower Willamette Group (LWG) and the U.S. Environmental Protection Agency (EPA) have committed to a process to work together to finalize each section of the revised Feasibility Study (FS). This submittal addresses those portions of Section 2 of the FS for which EPA has indicated discussions have concluded and on which it is commencing to draft the revised text.

In the course of our discussions, we have identified several issues where we believe it will be useful for EPA to have a written explanation of the LWG's technical positions and the reasons behind those positions for EPA to consider as EPA revises Section 2. What follows is a summary of the LWG issues and themes identified in the three attachments to this letter:

- Contaminants of concern (COCs) and preliminary remediation goals (PRGs) should only be selected for those contaminants and exposure scenarios identified as posing unacceptable risk in the approved baseline human health and ecological risk assessments. The FS should focus on PRGs for which acceptable risk levels can be achieved through a sediment-only cleanup (Attachment 1).
- Development and use of sediment background concentrations in the FS should be consistent with the conceptual site model for the Site based on the data collected (Attachments 2 and 3).
- Risk-based PRGs should be consistent with the spatial scales of the exposure scenarios used to characterize risk in the approved baseline human health and ecological risk assessments for evaluating cleanup alternatives. Risk-based PRGs should also be developed based on technically sound principles and application of risk management principles, as called for in the regulation and guidance (Attachments 1 and 3).

The LWG has focused this letter and attachments on specific technical issues, many of which fall under our overarching concern about the delay in applying risk management principles in order to establish the FS alternatives and assess them against the Comprehensive Environmental Response, Compensation, and Liability Act balancing criteria.

This input is part of the LWG's and EPA's efforts to reach consensus and develop a technically sound revised FS. It also is part of the continuing non-binding technical discussions that the parties agreed would precede EPA's revisions to each section. The LWG is also providing this input to continue our ongoing informal exchange of ideas and information. The comments provided herein, while certainly addressing many of the most important issues that have become apparent from the LWG's discussions with EPA, may not be our comprehensive list to be raised in either informal or formal dispute, given that EPA is currently revising Section 2.

We sincerely hope this information will be valuable to EPA as it undertakes the process of revising Section 2. We and our consultants remain available to discuss with EPA any issue we have raised here.

Sincerely,

Bob Wyatt

cc: Sean Sheldrake, U.S. Environmental Protection Agency, Region 10
Confederated Tribes and Bands of the Yakama Nation
Confederated Tribes of the Grand Ronde Community of Oregon
Confederated Tribes of Siletz Indians of Oregon
Confederated Tribes of the Umatilla Indian Reservation
Confederated Tribes of the Warm Springs Reservation of Oregon
Nez Perce Tribe
Oregon Department of Fish & Wildlife
United States Fish & Wildlife
Oregon Department of Environmental Quality
LWG Legal
LWG Repository

ATTACHMENT 1 – CONTAMINANTS OF CONCERN AND PRELIMINARY REMEDIATION GOALS ISSUE STATEMENT FOR SECTION 2 OF THE REVISED FEASIBILITY STUDY

1 - EXECUTIVE SUMMARY

This attachment provides input that the Lower Willamette Group (LWG) urges the U.S. Environmental Protection Agency (EPA) to incorporate as it prepares Section 2 of the revised Feasibility Study (FS) Report. In particular, Attachment 1 addresses the designation of contaminants of concern (COCs) and preliminary remediation goals (PRGs) for the Portland Harbor Superfund Site. Specifically, the LWG urges EPA to narrow the lists of COCs and PRGs that are identified in the FS and against which the success of the Portland Harbor remedial action will be measured.

The LWG has reviewed law, EPA guidance and the process applied by other EPA regions, including at similarly complex sediments sites, to distill several principles we believe should guide COC and PRG selection at Portland Harbor:

- COCs should only be designated for contaminant exposure scenario pairs (ecological or human health) for which the EPA-approved baseline risk assessments identified potentially unacceptable risk from in-river media (e.g., not for potential upland sources). PRGs should be established for these COCs consistent with risk assessment methods and only where sufficient technically valid information exists to do so.
- Because remedial action objectives (RAOs) "should reflect objectives that are achievable from the site cleanup" (EPA 2005), the FS should focus on those COCs and PRGs that are technically practicable to achieve and for which acceptable risk levels can be reached through the remedial action alternatives being evaluated in the FS.
- COCs and PRGs should not be established if reasonably conservative risk management principles indicate that a contaminant is not significantly contributing to risk and that evaluation of remedial alternatives with respect to a PRG for a particular COC/exposure pathway pairing is not necessary in order to select a protective remedy.

EPA has currently proposed a list of 46 COCs and 192 PRGs. As discussed below, the LWG believes this list can and should be reduced to closer to 23 COCs and 55 PRGs.

2 - INTRODUCTION

The LWG's March 2012 Draft FS Report was developed based upon a list of 46 PRGs and direction on development of benthic PRGs that EPA provided to the LWG in April 2010. At that time, EPA directed the LWG to use this set of PRGs in the development and screening of FS alternatives and advised the LWG that it did not "anticipate any significant changes to the list of

COCs and PRGs." EPA stated, "Most, if not all, of the PRGs in this list will also be carried forward for use in the evaluation of the final cleanup alternatives" (EPA 2010).

EPA has stated that it is now considering using an expanded and revised list of COCs and PRGs in its revisions to the FS Report. At present, we understand the starting point for this list to be contained in tables provided by EPA on April 11, 2014.[1] We understand that EPA intends Section 2 of the revised FS Report to present the RAOs that EPA identified in 2009 (which are also presented in Section 3.2 of the March 2012 draft FS Report). Section 2 will also identify COCs and PRGs related to each RAO.

The LWG believes that, by expanding the lists of COCs and PRGs rather than narrowing them, EPA is missing an important critical step to focusing the FS and, by extension, the remedial action itself. The PRG list that EPA provided to the LWG on April 11, 2014, contains 192 separate PRGs, which is over four times the number of PRGs EPA directed the LWG to use in April 2010, almost three times more than the most identified at any other National Priorities List (NPL) site (the Lower Duwamish has the high of 68), and is much larger than the number of PRGs commonly identified at most sediment sites. As discussed in the LWG's Risk Management Recommendations (Kennedy Jenks and Windward 2011), a much smaller list of PRGs would be sufficient to develop and evaluate remedial alternatives protective of human health and ecological resources.

Section 3 of this document contains a brief discussion of the statutory and regulatory provisions under which EPA is requiring remedial action and provides a summary of relevant EPA guidance on COC and PRG selection, as well as the provisions of the Portland Harbor Consent Order governing COC and PRG selection for this FS. Section 3 also includes a summary of COC and PRG selection at other NPL sites.

Section 4 provides summary principles that the LWG believes EPA should use in designating COCs and establishing PRGs.

Section 5 provides detailed examples of how the principles identified in Section 4 play out with respect to contaminants for which EPA has indicated an intent to significantly modify selected COCs and PRGs for the revised FS.

Section 6 contains a summary of the LWG's recommendations for each of the COCs and PRGs identified on EPA's April 11, 2014 tables consistent with those principles. Table 2, discussed in Section 6, contains an annotation of EPA's proposed PRG table and shows how the LWG believes EPA's proposed list of 192 PRGs should be at the very least reduced to 55. Where we disagree with EPA's intended COC or PRG, Table 2 provides the basis for that disagreement.

3 - REGULATORY FRAMEWORK

Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) authorizes EPA to take response actions "necessary to protect public health or

[1] EPA has indicated that EPA revisions to this table are underway, but the April 11, 2014, table was the one available for this review.

welfare or the environment.[2]" Section 106 allows EPA to require potentially responsible parties to perform removal or remedial actions when there is an "imminent and substantial endangerment to public health or welfare or the environment because of an actual or threatened release of a hazardous substance from a facility.[3]"

EPA guidance states the following:

> "As a general policy and in order to operate a unified Superfund program, EPA generally uses the results of the baseline risk assessment to establish the basis for taking a remedial action using either Section 104 or 106 authority. *** If the baseline risk assessment and the comparison of exposure concentrations to chemical-specific standards indicates that there is no unacceptable risk to human health or the environment and that no remedial action is warranted, then the CERCLA Section 121 cleanup standards for selection of a Superfund remedy, including the requirement to meet applicable or relevant and appropriate requirements (ARARs), are not triggered" (EPA 1991).

In other words, where the baseline risk assessment concludes that a human or ecological receptor will not be exposed to potentially unacceptable risk by a contaminant present in a given media, there is no basis for taking remedial action. Where no remedial action is warranted, development or refinement of preliminary or final remediation goals is unnecessary.

Selection of Preliminary Remediation Goals for the Evaluation of In-water Remedial Alternatives

If remedial action is warranted, the baseline risk assessments should be used to modify and refine the PRGs used for the evaluation of potential remedial alternatives in the FS (EPA 1991). Section 4.2.1 of EPA's Remedial Investigation/Feasibility Study Guidance states:

> "Although the preliminary remediation goals are established on readily available information [e.g., reference doses (Rfds) and risk-specific doses (RSDs)] or frequently used standards (e.g., ARARs), the final acceptable exposure levels should be determined on the basis of the results of the baseline risk assessment and the evaluation of the expected exposures and associated risks for each alternative (EPA 1988)."[4]

Refinement of the PRGs "should be consistent with the approaches used in the human health and ecological risk assessments" (EPA 2005).

PRGs for the FS are further refined through the application of risk management principles. For example:

> "Preliminary remediation goals for carcinogens are set at a 10^{-6} excess cancer risk as a point of departure, but may be revised to a different risk level within the acceptable risk

[2] 42 U.S.C. §104(a)(1).
[3] 42 U.S.C. §9606(a).
[4] *See also*, 40 CFR 300.430(e)(2)(i) (In the FS, EPA should "establish remedial action objectives [...] and remediation goals. *** Preliminary remediation goals should be modified, as necessary as more information becomes available during the RI/FS.")

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

> range based on the consideration of appropriate factors including, but not limited to: exposure factors, uncertainty factors, and technical factors. Included under exposure factors are: the cumulative effect of multiple contaminants, the potential for human exposure from other pathways at the site, population sensitivities, potential impacts on environmental receptors, and cross-media impacts of alternatives. Factors related to uncertainty may include: the reliability of alternatives, the weight of scientific evidence concerning exposures and individual and cumulative health effects, and the reliability of exposure data. Technical factors may include: detection/quantification limits for contaminants, technical limitations to remediation, the ability to monitor and control movement of contaminants, and background levels of contaminants. The final selection of the appropriate risk level is made when the remedy is selected based on the balancing of criteria (see preamble discussion below on remedy selection)."

55 Fed. Reg. 8666 at 8717 (March 8, 1990). EPA generally uses the 10^{-4} to 10^{-6} risk range as a "target range" within which to manage risks (EPA 1991).

Similarly, refinement of PRGs for ecological receptors should take into account factors such as causality between levels of contamination and effects; the magnitude, severity, areal extent, and duration of observed or predicted adverse effects; and whether these effects exceed natural changes of reference areas (EPA 1999). "There is no 'magic' number that can be used" (EPA 1999).

EPA ecological risk assessment guidance describes additional factors that can be evaluated in determining whether a contaminant of potential concern is actually a COC (EPA 2001). These factors include: background levels, frequency and magnitude of detection, dietary considerations (e.g., whether the contaminant is a nutrient), and others. While this guidance is intended to inform the transition from a screening level to baseline risk assessment, as further discussed below, EPA has not fully considered many of these risk management factors at any phase of the approved risk assessments.

The Portland Harbor Consent Order similarly directs the LWG to update the PRGs during the FS based upon the results of the baseline risk assessments.[5]

Selection of Contaminants of Concern and Preliminary Remediation Goals for Source Control

The LWG understands the importance of source control goals to EPA and their relation to the comprehensive actions for the Site, but those goals should appropriately be addressed through the implementation of EPA's Joint Source Control Strategy (JSCS) with DEQ. The goal of the JSCS is to "identify, evaluate, and control sources of contamination that may reach the

[5] See Administrative Settlement Agreement and Order on Consent for Remedial Investigation/Feasibility Study, U.S. EPA Docket Number CERCLA 10-2001-0240, SOW §9.1.1 ("Revised RAOs will include updated PRGs that were initially calculated by the Respondents during the RI. […] These modified PRGs will specify the contaminants and media of interest, exposure pathways and receptors and an acceptable contaminant level or range of levels (at particular locations for each exposure route);" SOW §9.1.6 ("PRGs for each chemical in each medium will also be modified as necessary to incorporate any new risk assessment information presented in the baseline risk assessment report").

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Willamette River, in a manner consistent with the objectives and schedule of the Portland Harbor RI/FS." It also provides that "[u]pland sources of contamination that adversely impact or have the potential to adversely impact the Willamette River, within the Portland Harbor Superfund Site, should be addressed in accordance with the [February 8, 2001 Memorandum of Understanding among EPA, DEQ and other governmental parties] and the JSCS" (DEQ and EPA 2005, p. ii).

The Portland Harbor Consent Order dovetails with the Memorandum of Understanding (MOU) and the JSCS but does not assign responsibility for the implementation of source control to the LWG. The MOU and the Consent Order laid out a rational process that shaped the collection and analysis of information for the last 13 years and provided for means of source control that used each agency's authority to optimize resources. Because of the scope of the RI/FS defined by the MOU and the Consent Order, data on upland sources were not collected or comprehensively compiled during the RI, and risks related to upland sources (as distinguished from, for example, groundwater present in the transition zone) were not evaluated in the baseline risk assessments. Departing from the dovetailed process at this late date by establishing PRGs for source control without having performed the necessary analysis and data collection will derail the JSCS and unnecessarily delay remedy implementation.

The EPA-approved Programmatic Work Plan states, "PRGs will be developed for those chemicals driving unacceptable risks and having sources within the [initial study area] ISA" (LWG 2004). No upland source control actions have ever been contemplated to be evaluated in the FS, and upland source control is not an objective that is "achievable from the site cleanup" (EPA 2005). It is untenable to include COCs and PRGs for upland source control in the FS, especially because these standards would be disconnected from the rest of the RI/FS process, and none of the alternatives evaluated in the FS will address them. Rather, the FS explains that upland sources will be controlled through the actions of DEQ under the MOU (LWG 2004).

Comparison with Contaminants of Concern and Preliminary Remediation Goal Selection at Other Sediment Sites

EPA has currently proposed 192 PRGs for Portland Harbor. The number of PRGs identified at other sites around throughout the country is consistently lower because the decision making at each of those sites included the application of risk management decisions, as called for in the regulation and guidance discussed previously.[6] In fact, at none of those sites did EPA establish as large a number of PRGs for as many contaminant/pathway combinations as are proposed in EPA's current working draft of Section 2 for the Portland Harbor FS.

Very frequently, EPA develops PRGs or Remedial Goals only for a sub-set of COCs, particularly where cleanup of those COCs will address other COCs where contamination is largely co-located. This approach has the advantage of simplifying the overall remedy decision-making process as well as its implementation. While risk management was applied at these sites at different points in the process (sometimes in the identification of COCs, sometimes in the identification of PRGs, and sometimes in setting cleanup goals), the sites are consistent in that

[6] Appendix A provides a summary of how EPA has established COCs and PRGs at other sediment sites throughout the country.

COCs and/or PRGs were narrowed based on a combination of the following key points, which were sometimes specifically stated (and, therefore, referenced below) and sometimes just applied:

- COCs (and, therefore, PRGs) are identified only for site-related contaminants (e.g., McCormick & Baxter, Harbor Oil).
- PRGs are only established for the COCs and exposure pathways where potentially unacceptable risk is present (e.g., Hudson, Duwamish, and Sangamo Weston/Twelve-Mile Hartwell), sometimes only for those with the most potentially unacceptable risk in the most exposure scenarios (e.g., Fox, McCormick & Baxter, and Passaic) and sometimes only one PRG was set per COC (e.g., Passaic).
- Risk-based PRGs are adjusted (or eliminated, as appropriate) to take into account background (e.g., McCormick & Baxter, Commencement Bay, and Harbor Oil).
- PRGs were not established for contaminants of potential concern (COPCs) with infrequent detections (e.g., Commencement Bay, Duwamish, and Fields Brook).

In summary, all of these sites developed COCs and PRGs for a limited set of contaminants.

4 - PRINCIPLES THAT THE LWG BELIEVES EPA SHOULD FOLLOW IN DESIGNATING COCS AND ESTABLISHING PRGS

Consistent with regulation, guidance and examples discussed above, the LWG requests EPA apply the following principles in designating COCs and establishing PRGs for the Portland Harbor Superfund Site:

- COCs *should* only be designated for contaminant exposure scenario pairs (ecological or human health) for which the EPA-approved baseline risk assessments identified potentially unacceptable risk from in-river media.
- PRGs *should* only be established for COCs as defined above consistent with risk assessment methods, where sufficient technically valid information exists to do so.
- Because RAOs "should reflect objectives that are achievable from the site cleanup" (EPA 2005), the FS should focus on those COCs and PRGs that are technically practicable and for which acceptable risk levels can be reached through the remedial action alternatives being evaluated in the FS.
- PRGs *should not* be established if no potentially unacceptable risk was found in the risk assessment for a COC/exposure pathway pairing.
- PRGs *should not* be established based on exposure pathways being evaluated in upland source control evaluations under DEQ. These actions are outside the scope of the RI/FS. These potential risk exposure pathways were not evaluated in the RI and the FS will provide no evaluation of remedial alternatives for upland sources.

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

- COCs and PRGs *should not* be established if reasonably conservative risk management principles indicate that a contaminant is not significantly contributing to risk and that evaluation of remedial alternatives with respect to a PRG for a particular COC/exposure pathway pairing is not necessary in order to select a protective remedy.

Through application of these principles, the LWG believes that EPA would revise certain of the proposed PRGs, specifically the following:

- Consistent with the BHHRA, the calculation of the human health sediment direct contact PRGs for RAO 1 should include a factor of 4 from the fisher scenarios exposure calculation for sediment contact frequency (i.e., site use factor).
- Tissue levels under human health bioaccumulation RAO 2 should be consistent with the scenario identified as posing an unacceptable risk in the BHHRA.
- Background-based PCB sediment PRG under RAO 2 should be established from readily available information on site equilibrium levels. The tissue level for PCBs under RAO 2 should reflect background concentrations.
- Risk-based sediment PRGs under RAO 2 should be calculated consistent with technically defensible methods that are consistent with the BHHRA. Specifically, the dioxin/furan TEQ PRG should be based on the strong regression relationship between 2,3,4,7,8-PeCDF and the TEQ in tissue and using a location-specific (i.e., RM or zone) contribution of 2,3,4,7,8-PeCDF to the TEQ in sediment. The BaPEq PRG should be expressed on an organic carbon normalized basis consistent with the clam/sediment relationship used to develop the PRG. For hexachlorobenzene, the PRG for a multi-species diet should be the average of the PRGs for the individual species, not the reciprocal of the sum of the reciprocals.
- Water PRGs under RAO 2 should be based on organism only criteria, rather than organism plus water criteria, and for mercury, should be verified to come from an actual relevant water quality standard or criterion.
- Sediment PRGs under ecological direct contact RAO 5 that are based on benthic toxicity endpoints should not use individual benthic criteria. Consistent with the EPA-approved CBRA, the PRG for RAO 5 should be to meet two of the three predicted benthic toxicity thresholds that are used in the CBRA (LRM L3 Pmax less than or equal to 0.59, FPM L3 MQ less than or equal to 0.7, and PEC MQ less than or equal to 0.7).
- Sediment PRGs under ecological bioaccumulation RAO 6 should be calculated consistent with the methods from the BERA. Specifically, the PCB PRG should be 79 µg/kg, which is the lower confidence limit associated with the population-level effect on mink. The dioxin/furan TEQ PRG should be calculated following the method summarized for RAO 2 above.
- The AWQC-based PCB water PRG under RAO 6 should be superseded by the site-specific risk-based sediment PRG, which is based on a bioaccumulation model that accounts for both sediment and water exposure.

- For several contaminants under ecological groundwater RAO 8, it is not appropriate to apply a surface water TRV as a TZW PRG because the exposure pathway is not complete and significant.

Finally, the LWG does not agree tissue levels should be performance goals for the remedy or should be defined as "PRGs" under RAO 2 for the revised FS. However, the LWG understands monitoring fish tissue after remedy implementation as a gauge of overall improvement of river conditions may be prudent.

Note that this attachment does not address the issue of background, which is addressed separately in Attachments 2 and 3. In all cases, PRGs that are lower than background should be revised to background and, if contaminants are not present at concentrations in excess of background, then those PRGs should be eliminated.

Section 5 of this document provides detailed examples of decisions regarding specific COCs and PRGs to illustrate these concepts. Section 6 and Table 2 provides the LWG's input with respect to each of the PRGs as tentatively proposed by EPA in its April 11, 2014 transmittal.

5 - CASE EXAMPLES OF EPA PORTLAND HARBOR CONTAMINANTS OF CONCERN/PRELIMINARY REMEDIATION GOAL SELECTIONS

This section describes several case examples where EPA's proposed human health and ecological PRGs are inconsistent with the regulatory framework described in Section 2. In each case, EPA has made decisions that do not consider reasonable risk management aspects of the BHHRA and BERA results. These examples are intended to illustrate wider issues that apply to many of EPA's proposed PRG selections without providing detailed input on each and every PRG selection. Section 6 and Table 2 contain a complete summary list of the PRGs where the LWG recommends an outcome different than what is presented in EPA's April 11, 2014 list of proposed PRGs.

Human Health Case Examples

Example 1: Gamma-HCH

- **For RAOs 2 and 3, there is no potentially unacceptable risk.**
- **For RAO 4, it is not appropriate to establish a PRG to address upland source control risks that are not included within RAO 4 and were therefore not evaluated in the BHHRA.**

Gamma-hexachlorocyclohexane (gamma-HCH) was tentatively identified as a COC by EPA for RAOs 2 (fish consumption), 3 (surface water exposure), and 4 (groundwater). Gamma-HCH was an analyte in sediment, surface water, fish tissue, and shellfish tissue and was detected in all media (groundwater was not analyzed in the BHHRA). For fish consumption, gamma-HCH was evaluated per EPA approval in the BHHRA on both a Study Area-wide basis and RM basis for the different fish consumer scenarios. The highest risk from gamma-HCH was 7×10^{-7} for whole body tribal fish consumption. Gamma-HCH was not identified as a chemical potentially posing unacceptable risks for fish consumption. For surface water direct contact, the maximum detected concentration of gamma-HCH in surface water was less than the risk-based screening level and maximum contaminant level (MCL), so gamma-HCH was not selected as a chemical of potential concern for direct contact with surface water in the BHHRA. With respect to the groundwater exposure scenarios relevant to RAO 4 (direct exposure to contaminated groundwater and indirect exposure to contaminated groundwater through fish and shellfish consumption), groundwater was not evaluated in the BHHRA. As noted above, bioaccumulation risks were less than 1 x 10^{-6} and hazard quotients (HQs) were less than 1 from gamma-HCH for all fish (and shellfish) consumption scenarios. Therefore, because no potentially unacceptable risk for gamma-HCH was identified through the EPA-approved BHHRA, gamma-HCH should not be considered a COC for either fish consumption, direct contact with surface water or groundwater.

Example 2: Aldrin

- **For RAO 2, reasonably conservative risk management principles suggest that aldrin is not significantly contributing to risk and that evaluation of remedial alternatives with respect to a PRG for this particular COC/exposure pathway pairing is not necessary in order to select a protective remedy**
- **For RAO 3, the BHHRA concluded there was no potentially unacceptable risk.**

Aldrin was identified as a COC by EPA for RAOs 2 (fish consumption) and 3 (surface water exposure). Aldrin was an analyte in sediment, surface water, fish tissue, and shellfish tissue and was detected in all media. For fish consumption, aldrin was evaluated per EPA approval in the BHHRA on both a Study Area-wide basis and RM basis for the different fish consumer scenarios. The highest risk from aldrin was 1 x 10^{-6} for whole body tribal fish consumption. For shellfish consumption, aldrin resulted in a risk greater than 1 x 10^{-6} for Asian clam consumption in a single RM (8 West). The risks from aldrin at RM 8 West were 9 x 10^{-6} for the consumption rate of 18 grams per day and 2 x 10^{-6} for the consumption rate of 3.3 grams per day. Based on this single RM, aldrin was identified as a chemical posing potentially unacceptable risk for clam consumption. However, the relative contribution of aldrin to cancer risks in that RM was less than 5 percent. Furthermore, no agency or private party has ever demonstrated that the illegal consumption of Asian clam actually occurs on an ongoing basis within Portland Harbor. Therefore, based on risk management considerations consistent with EPA guidance, aldrin should not be considered a COC for fish (shellfish) consumption.

Also with respect to RAO 3, aldrin was selected in the BHHRA as a chemical of potential concern in surface water for divers and future domestic water use. The highest risk from aldrin was 1 x 10^{-6} at a single sample location for future domestic water use (all other risk estimates for direct contact with surface water were orders of magnitude less than that). Therefore, aldrin should not be considered a COC for direct contact with surface water.

Example 3: Total Chlordanes

- **For RAO 2, reasonably conservative risk management principles suggest that total chlordanes are not significantly contributing to risk and that evaluation of remedial alternatives with respect to a PRG for this particular COC/exposure pathway pairing is not necessary in order to select a protective remedy.**

- **For RAO 3, the BHHRA concluded there was no potentially unacceptable risk.**
- **For RAO 4, it is not appropriate to establish a PRG to address upland source control risks that are not included within RAO 4 and were therefore not evaluated in the BHHRA.**

Total chlordanes were identified as a COC by EPA for RAOs 2 (fish consumption), 3 (surface water direct contact) and 4 (groundwater). Chlordanes were analyzed in sediment, surface water, fish tissue, and shellfish tissue and were detected in all media. (Groundwater was not analyzed in the BHHRA.) For fish consumption, chlordanes were evaluated per EPA approval in the BHHRA on both a Study Area-wide basis and RM basis for the different fish consumer scenarios. The highest risk from chlordanes was 1 x 10^{-5} for whole body tribal fish consumption. For fillet consumption, chlordanes resulted in a risk of 2 x 10^{-6} for subsistence and tribal consumption on at Study Area-wide basis. For recreational consumption on a RM basis (and Study Area-wide), chlordanes did not result in risks greater than 1 x 10^{-6}. Shellfish consumption also did not result in risks greater than 1 x 10^{-6} at any location for both crayfish and illegal Asian clam consumption. For whole body tribal fish consumption, where the risk was 1 x 10^{-5}, chlordanes only account for 0.1 percent of the total theoretical cancer risk. Furthermore, the smallmouth bass tissue concentrations are consistent throughout the Study Area and do not indicate a localized source that is affecting fish tissue. This concentration distribution is indicative of upstream (non-CERCLA) sources passing through the entire site. Therefore, based on risk management considerations consistent with EPA guidance, total chlordanes should not be considered a COC for fish consumption.

With respect to RAO 3, the maximum detected concentration of total chlordanes in surface water was less than the risk-based screening level and MCL, so total chlordanes were not selected as a chemical of potential concern for exposure to surface water in the BHHRA. Therefore, total chlordanes should not be considered a COC for exposure to surface water.

With respect to the groundwater exposure scenarios relevant to RAO 4 (direct exposure to contaminated groundwater and indirect exposure to contaminated groundwater through fish and shellfish consumption), groundwater was not evaluated in the BHHRA. Chlordanes were not detected in shoreline seep samples, and as noted above, the BHHRA results suggest that chlordanes pose no potentially unacceptable bioaccumulation risk due to CERCLA sources.

Ecological Case Examples

Example 1: Cadmium

- **For RAO 7 and for RAO 6 as applied to wildlife, the BERA concluded there was no potentially unacceptable risk.**
- **For RAO 5 and RAO 6 as applied to fish, reasonably conservative risk management principles suggest that cadmium is not significantly contributing to risk and that evaluation of remedial alternatives with respect to a PRG for this particular COC/exposure pathway pairing is not necessary in order to select a protective remedy.**

Cadmium was identified as a COC by EPA for ecological RAOs 5 (sediment), 6 (bioaccumulation), and 7 (surface water). EPA has proposed Cd PRGs for RAOs 5 and 7.

The maximum cadmium concentration measured in surface water was 0.05 micrograms per liter (µg/L), and the screening level TRV was 0.09 µg/L, so cadmium was not identified in the BERA as a surface water COPC. Therefore, cadmium is not a surface water COC and should not have an RAO 7 PRG.

EPA's proposed cadmium sediment PRG for RAO 5 is 3.5 milligrams per kilogram (mg/kg) dry weight (dw), which is the Probable Effects Level (PEL). Cadmium was not included in EPA's site-specific Linear Regression Model (LRM), indicating that EPA did not find cadmium to be a useful predictor of sediment toxicity. The proposed Cd PRG was exceeded in just 7 out of 1,126 sediment samples. This strongly indicates that cadmium does not pose risk to the Portland Harbor benthic community and risk management principles should be applied to determine that evaluation of remedial alternatives with respect to a cadmium PRG for RAO 5 is not necessary in order to select a protective remedy. Moreover, the use of individual chemical toxicity screening values is inconsistent with the revised CBRA as recently provided by EPA in 2014.[7]

Although EPA does not identify a PRG for RAO 6 (bioaccumulation), EPA's COC tables indicate that cadmium is also a proposed COC for this RAO. Cadmium should not be identified as a COC for RAO 6, because the BERA identified no potentially unacceptable cadmium risk to wildlife, so cadmium is not a bioaccumulation wildlife COC. For fish, the EPA-approved BERA indicated cadmium poses potentially unacceptable risk based only on the dietary line of evidence (LOE) for juvenile Chinook salmon (*Oncorhynchus tshawytscha*) and sculpin. Therefore, for the following reasons, it should not be a COC:

- Low frequency of TRV exceedance in sculpin prey samples (9 of 111 [8.1 percent] prey samples, with maximum HQ = 2.2; and 1 of 1,348 [less than 0.1 percent] sediment samples)
- Weakness of the Chinook exposure estimate (juvenile Chinook were conservatively presumed to feed predominantly on benthic organisms; this feeding strategy is contrary to the literature, which shows they feed predominantly on pelagic organisms)
- Uncertainty about the toxicological effects associated with the TRV (rockfish [lowest observed apparent effects level] LOAEL setting the TRV is two to three orders of magnitude below the nine NOAELs from other studies, including four NOAELs and two LOAELs for salmonids)
- Low magnitude of juvenile Chinook salmon dietary HQ (3.5, assuming mixed-prey diet) when taking into account the likelihood that both exposure and effects are over-estimated (per the two previous items)

[7] As discussed more in Attachment 3 (under same cover), the RAO 5 PRG should be to meet two of the three predicted benthic toxicity thresholds that are used in the CBRA (LRM L3 Pmax less than or equal to 0.59, FPM L3 MQ less than or equal to 0.7 and PEC MQ less than or equal to 0.7).

- Discordance of the dietary LOE with the surface water and tissue-residue LOEs. The cadmium AWQC is based on a very large dataset, so it is the strongest LOE; the tissue-residue LOE is weak because fish sequester or otherwise bioregulate inorganic metals.

The multiple lines of evidence presented above provide a strong case against identifying cadmium as a COC for fish.

In summary, cadmium should not be a COC, and the RAO 5 and 7 PRGs should be dropped.

Example 2: DDx

- **For RAO 6, reasonably conservative risk management principles suggest that DDx is not significantly contributing to risk and that evaluation of remedial alternatives with respect to a PRG for this particular COC/exposure pathway pairing is not necessary in order to select a protective remedy.**

Total DDx was identified as a COC by EPA for all four ecological RAOs. PRGs were developed for all four RAOs as well. The issue addressed in this case example specifically concerns the surface water PRG for RAO 6. The RAO 6 surface water PRG for total DDx is an AWQC based on the protection of brown pelican via ingestion of contaminated prey. However, the site-specific BERA found no risk to piscivorous birds from exposure to DDx. The only receptor with a sum DDE or total DDx HQ greater than 1 is the spotted sandpiper population. The maximum HQ was 1.5, and the HQ was greater than or equal to 1.0 in only one of four exposure areas (RM 7.0 to RM 9.0), and only based on a 100 percent worm consumption dietary assumption. The maximum HQ was less than 1 for clam-only and mixed diet assumptions. Also, the TRV was very conservative in that the selected LOAEL was consistent with the lowest literature-based LOAEL where mallard eggshell thinning of about 6 percent was statistically significantly different from the control. However, reproductive effects in field populations of birds have not been documented for eggshell thinning of less than 15 to 20 percent. The EPA-approved BERA states there is no demonstrative evidence of egg thinning that would have an adverse effect on reproductive success. The weight of evidence strongly supports dropping the RAO 6 surface water PRG for total DDx.

Example 3: Manganese

- **For RAO 8, the proposed PRG for manganese should be first updated and then retained as a PRG only if TZW concentrations evaluated in the BERA exceed an HQ of 10.**

EPA identified manganese as a COC and developed a PRG for RAO 8 (groundwater). As EPA agreed in recent FS technical discussions, the manganese PRG should be updated to reflect more recently developed ecotoxicological data. In addition, it should be adjusted to reflect the hardness of TZW, as increasing hardness decreases manganese bioavailability and hence toxicity (Davies 1980, Stubblefield et al. 1997, Reimer 1999, BCMOE 2001, and Peters et al. 2011). Also, both Colorado and New Mexico have hardness dependent state water quality criteria (CDPHE 2012 and NMED 2011). The LWG is in the process of incorporating both toxicity and hardness-based refinements. Preliminary results indicate that average HQs for the TZW sampling areas, based on average dissolved manganese and hardness concentrations, would range from 0.2 to 4.1 based on the refinements considered to date (Table 1). Some last

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

evaluations and potential data sources are being considered that could influence the hardness-based manganese HQs in Table 1, but it is expected that any changes would be relatively minor.

Table 1. Preliminary Average Hazard Quotients by Transition Zone Water Sampling Area.

			Windward Calculated Toxicity Value		Colorado/New Mexico Water Quality Criteria	
Area	**Mean Diss. Mn (µg/L)**	**Mean Hardness (mg/L)**	**Mean Hardness-based Mn TRV (µg/L)**	**Mean HQ**	**Mean Hardness-based Mn TRV (µg/L)**	**Mean HQ**
ARCO	2928	246	1969	1.5	2227	1.3
Arkema-Acid Plant	6235	1313	8230	0.8	3890	1.6
Arkema-Chlorate Plant	683	569	4028	0.2	2944	0.2
ExxonMobil Oil	4066	222	1802	2.3	2151	1.9
Gasco	4248	252	2009	2.1	2245	1.9
Gunderson	2170	319	2459	0.9	2429	0.9
Kinder Morgan	5027	141	1221	4.1	1849	2.7
Rhone Poulenc	6179	576	4070	1.5	2956	2.1
Siltronic	4490	267	2108	2.1	2287	2.0
Willbridge	2991	209	1712	1.7	2109	1.4

Notes:
µg/L = micrograms per liter
mg/L = milligrams per liter
Mn = manganese
All TZW samples presented here contained unfiltered water, which due to the presence of particulates in the sample, likely overestimates the presence of manganese, other metals, and hydrophobic contaminants bioavailable in TZW.

Additionally, based upon the multiple lines of evidence presented in Section 6.6.3.3 of the Final BERA (which apply generally to all TZW contaminants, not just manganese), a PRG multiplier of at least 10 should be applied to account for the processes that prevent benthic infauna from being exposed to undiluted TZW or porewater. None of the preliminary HQs calculated in Table 1 exceed 10.

In summary, the multiple lines of evidence discussed in Section 6.6.3.3 of the Final BERA supporting a multiplier of 10 are as follows:

- Although benthic organisms reside in the sediment column or are in contact with the sediment surface, the water column rather than the sediment matrix is thought to provide more exposure to contaminants (Hare et al. 2001). The TZW samples evaluated represent a sediment layer (30 to 38 cm below the surface) that is deeper than that typically used by benthic organisms (0 to 20 cm) or observed being used at this site (0 to 12 cm).

- With respect to the burrowing organisms that live below the oxic zone, many species have adaptations that introduce oxygenated overlying water into their tubes or burrows for both respiration and feeding, essentially extending the sediment-water interface into the sediment column (Lee and Swartz 1980).

- Filter-feeding organisms depend on the flow of water to gather food, extending specialized appendages or structures into the water column to trap particles.

- The biological activity of benthic invertebrates can also enhance the exchange of porewater with overlying water by increasing the roughness of the sediment surface (Huettel and Rusch 2000, Hoffman 2005, and Precht and Huettel 2003).

Finally, specifically with respect to manganese, mixing TZW and surface water will reduce manganese exposure in another way as well. The RI provides evidence that changes to water chemistry above the redox potential discontinuity (RPD), which is where most benthic organisms would be exposed, will cause substantial amounts of manganese to precipitate out of solution, thereby reducing the exposure point concentration above and beyond the reduction associated with mixing dilution. As noted above, the RI TZW samples were taken from 30 to 38 cm below the sediment surface, which is below the RPD observed at the Site.

The combination of factors described above provide a strong argument that manganese should not be a COC for RAO 8, and that the RAO 8 PRG for manganese should be dropped.

6 - SUMMARY OF LWG COC/PRG RECOMMENDATIONS

While Section 5 of this document provides detailed examples of COC and PRG disagreements consistent with the primary concepts in Sections 2 and 3, this section provides a summary of the LWG's disagreements with EPA's proposed COC/PRGs tables beyond the above examples. The outstanding disagreements are listed in Table 2.

Per the footnotes in Table 2, our comments are categorized into major types of issues as follows:

- Colored (tan) cells indicate the COC/PRG is not needed because it is inconsistent with the primary concepts presented in Section 2. This includes the following categories:

  - NE – Risk for this scenario was not evaluated in the risk assessment.
  - NR – No potentially unacceptable risk was found in the risk assessment for this contaminant via this pathway.
  - RM – Applying reasonably conservative risk management principles (consistent with the examples provided above), this contaminant should not be identified as a COC or require a PRG for this pathway.

- Other noted LWG comments on PRG values shown in Table 2 include the following categories:

  - C – The LWG agrees that a COC/PRG is potentially appropriate but does not agree the PRG is calculated or assigned from promulgated criteria correctly. These additional issues were noted to EPA in the LWG's April 23, 2014 PRG disagreements summary.

- T – The LWG agrees that the chemical was found to pose potentially unacceptable human health risk via fish consumption, but the LWG does not agree tissue levels should be performance goals for the remedy or should be defined as "PRGs" under RAO 2 for the revised FS.
- F – Per LWG's April 23, 2014 PRG disagreements list, EPA has only very recently (May 16, 2014) provided the LWG sufficient information for us to verify Food Web Model outputs used to calculate these values and has not yet been able to verify the values were calculated appropriately.
- BT – For benthic toxicity related PRGs, instead of using the PEC, EPA should follow the LWG recommendations in our April 23, 2014 list of disagreements (also discussed in Attachment 3 under this same cover).
- ND – No disagreement with the COC/PRG.

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

REFERENCES

Arnot, J.A., Gobas, FAPC., 2004. A food web bioaccumulation model for organic chemicals in aquatic ecosystems. Environ Toxicol Chem 23:2343-2355.

BCMOE (British Columbia Ministry of Environment), 2001. Ambient water quality guidelines for manganese. Overview report. http://www.env.gov.bc.ca/wat/wq/BCguidelines/manganese/manganese.html.

CDPHE. 2012. The basic standards and methodologies for surface water (5 CCR 1002-31). Regulation No. 31. Colorado Department of Public Health and Environment, Denver, CO. (see section 31.35)

Davies, P.H., 1980. Water pollution studies. Investigations on the toxicity of metals to fish. Federal Aid in Fish and Wildl. Restoration, Job Progress Rep. No. F-33-R-15. Colorado Division of Wildlife, Fort Collins, CO, USA.

DEQ (Oregon Department of Environmental Quality and EPA (U.S. Environmental Protection Agency), 2005. Portland Harbor Joint Source Control Strategy. Final December 2005.

EPA (U.S. Environmental Protection Agency), 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA p. 4-15 (OSWER Directive 9355.3-01).

EPA, 1991. Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions, p.3 (OSWER Directive 9355.0-30, April 22, 1991).

EPA, 1999. Ecological Risk Assessment and Risk Management Principles for Superfund Sites (OSWER Directive 9285.7-28 P, October 7, 1999).

EPA, 2001. The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments. OSWER Publication 9345.0-14. EPA 540/F-01/014. June 2001.

EPA, 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites, §2.4.1 (OSWER 9355.0-85, December 2005)

EPA, 2010. April 21, 2010 letter from Chip Humphrey and Eric Blischke, EPA Remedial Project Managers, to Jim McKenna of Port of Portand and Interim Chairman, Lower Willamette Group regarding Portland Harbor Superfund Site; Administrative Order on Consent for Remedial Investigation and Feasibility Study; Docket No. CERCLA-10-2001-0240

Forbes, T.L., Forbes, V.E., Giessing, A., Hansen, R., Kure, L.K., 1998. Relative role of pore water versus ingested sediment in bioavailability of organic contaminants in marine sediments. Environ Toxicol Chem 17(12):2453-2462.

Gardner, K.M., 1999. The importance of surface water/groundwater interactions issue paper. EPA 910-R-99-013. US Environmental Protection Agency Region 10, Seattle, WA.

Hare, L., Tessier, A., Warren, L., 2001. Cadmium accumulation by invertebrates living at the sediment-water interface. Environ Toxicol Chem 20(4):880-889.

Hoffman, B., 2005. Effect of advective pore water flow on degradation of organic matter in permeable sandy sediment: a study of fresh and brackish water. Masters thesis. Linkopings University, Norrkoping, Sweden.

Huettel M., and Rusch, A., 2000. Transport and degradation of phytoplankton in permeable sediments. Limnol Oceanogr 45(3):534-549.

Kennedy/Jenks and Windward Environmental. 2011. Portland Harbor RI/FS Risk Management Recommendations. Contaminants of Concern, Receptors, Pathways, and Benthic Areas of Concern for the Feasibility Study. Prepared for the Lower Willamette Group. July 22, 2011.

Krantzberg, G., 1985. The influence of bioturbation on physical, chemical and biological parameters in aquatic environments. A review. Environ Pollut (Series A) 39(2):99-122.

Lee H., II, Swartz, R.C., 1980. Chapter 29. Biological processess affecting the distribution of pollutants in marine sediments, Part II. biodeposition and bioturbation. In: Baker RA, ed, Contaminants and sediments. Vol 2. Ann Arbor Science Publishers, Ann Arbor, MI, pp. 555-606.

LWG, 2004. Portland Harbor RI/FS Programmatic Work Plan, April 23, 2004. Prepared for the Lower Willamette Group. Prepared by Integral, Windward, Kennedy Jenks, Anchor Environmental, and Groundwater Solutions. Final EPA approved version.

NMED, 2011. State of New Mexico standards for interstate and intrastate surface waters. 20.6.4 NMAC. New Mexico Environmental Department, Santa Fe, NM.

Peters, A., Lofts, S., Merrington, G., Brown, B., Stubblefield, W., Harlow, K., 2011. Development of biotic ligand models for chronic manganese toxicity to fish, invertebrates, and algae. Environ Toxicol Chem 30:2407-2415.

Precht, E., Huettel, M., 2003. Rapid wave-driven advective pore water exchange in a permeable coastal sediment. J Sea Res 51:93-107.

Rasmussen, A.D., Banta, G.T., Andersen, O., 2000. Cadmium dynamics in estuarine sediments: effects of salinity and lugworm bioturbation. Environ Toxicol Chem 19(2):380-386.

Reimer, P.S., 1999. Environmental effects of manganese and proposed guidelines to protect freshwater life in British Columbia. [M.S. Thesis]. University of British Columbia, Vancouver, Canada.

Riisgard, H.U., Larsen PS, 2005. Water pumping and analysis of flow in burrowing zoobenthos: an overview. Aqua Ecol 39:237-258.

Satoh, H., Nakamura, Y., Okabe, S., 2007. Influences of infaunal burrows on the community structure and activity of ammonia-oxidizing bacteria in intertidal sediments. App Environ Microbiol 73(4):1341-1348.

Stubblefield, W.A., Brinkman SF, Davies PH, Garrison TD, Hockett JR, McIntyre MW, 1997. Effects of water hardness on the toxicity of manganese to developing brown trout (Salmo trutta). Environ Toxicol Chem 16:2082-2089.

Vogel, S., 1994. Life in moving fluids: the physical biology of flow. Second ed. Princeton University Press, Princeton, NJ.

Winsor, M.H., Boese, B.L., Lee, H., Randall, R.C., Specht, D.T., 1990. Determination of the ventilation rates of interstitial and overlying water by the clam *Macoma nasuta*. Environ Toxicol Chem 9:209-213.

APPENDIX A – SUMMARY OF PROCESS AT OTHER SEDIMENT SITES FOR SETTING REMEDIATION GOALS

Site	Document	Summary of Relevant Information
McCormick & Baxter	ROD (March 1996)	The ROD provided the following summary related to the contaminants of concern identified for the human health risk assessment: Contaminants of concern were identified for the human health risk assessment based on knowledge of historical site activities (i.e., <u>only those contaminants known to be related to site activities were included</u>); relative toxicity; and concentrations detected. Because several of the contaminants of concern are ubiquitous in urban environments (e.g., PAHs and dioxins/furans), concentrations of these contaminants were compared to background concentrations and local reference concentrations. (p.40; Emphasis added.) Cleanup goals were not established for all contaminants of potential concern. The ROD explained that, for soil, cleanup goals were established for "compounds that pose the greatest potential risk to human health and environment at the Site. Because other contaminants of potential concern are co-located with these compounds, attainment of these cleanup levels would result in the cleanup of all contaminants of concern to protective levels" (p.49).
Lower Eight Miles of the Lower Passaic River	Proposed Plan (April 2014)	The Proposed Plan identified eight contaminants of concern (COCs): dioxins and furans, PCBs, Mercury, DDT, Copper, Dieldrin, PAHs, and Lead (p.7). Through the human health risk assessment, EPA determined that three of these COCs were the primary contributors to human health risk: dioxins and furans, PCBs, and mercury (p.14). EPA developed human health PRGs for only these three COCs. (p.17) Through the ecological risk assessment, EPA determined that all of the COCs (with the possible exception of lead) cause unacceptable risk. (p.15) However, EPA developed PRGs for only four of the COCs: dioxins, PCBs, mercury, and DDT. (p.17) EPA focused on these four COCs because (i) they are representative COCs, (ii) there were multiple lines of evidence developed to evaluate how the remedial alternatives would achieve the PRGs for these COCs, and (iii) most of the active remediation alternatives designed to address these COCs would also address the other COCs. (p.17) EPA selected a single sediment remediation goal (RG) for each of the four COCs for which it developed PRGs. (p.19) For dioxins and PCBs, EPA selected the human health PRGs as RGs, even though the ecological PRGs were more stringent, because EPA determined it was "unlikely that the ecological PRGs could be met under any of the alternatives within a reasonable time frame." (p.19)
Fox River (Operating Units 1 & 2)	ROD (December 2002)	The Baseline Human Health and Ecological Risk Assessment analyzed eight chemicals of potential concern (COPCs): PCBs, dioxins, furans, DDT/DDE/DDD, dieldrin, arsenic, lead, and mercury. The HHRA found that non-PCB contaminants presented substantially less risk compared to PCBs. The HHRA also found that some of the non-PCB contaminants identified in sediment had similar fate and transport properties and were generally found with PCBs. For this reason, the agencies concluded a remedy that effectively addressed PCB exposure would also address the other COPCs (with lesser toxicities) in the sediment. (p.23) The Screening Ecological Risk Assessment (SERA) focused on the potential for ecological risks associated with chemicals in sediments, surface waters, and biota. The SERA was conducted using conservative exposure and effects scenarios in an effort to identify which of the over 300 contaminants previously identified potentially posed risks to ecological receptors. The purpose of the SERA was to identify a smaller list of contaminants that would be carried through to the baseline risk assessment. (p.30)

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

		"Of the 75 chemicals that were above screening level risk criteria, only those with the most potential for adverse risk were carried forward as BLRA contaminants of potential concern (COPCs)." The eight COPCs retained for analysis in the BLRA were: PCBs, dioxins, furans, DDT/DDE/DDD, dieldrin, arsenic, lead, and mercury. One of the ecological goals of the BLRA was to identify "those COPCs [that] pose the greatest potential for risk to the environment and should be carried forward as contaminants of concern (COCs) in the FS." (p.31) The ROD explained that, consistent with the BLRA, "[t]he primary COC is PCBs, and other COCs carried forward for remedial evaluation and long-term monitoring are mercury and DDE." (p.49) The ROD explained that, "[c]onsistent with the NCP and RI/FS Guidance, [the agencies] developed remedial action objectives (RAOs) for the protection of human health and the environment. The RAOs specify the contaminants and media of concern, exposure routes and potential receptors, and an acceptable concentration limit or range for each contaminant for each of the various media, exposure routes and receptors. RAOs were then used to establish specific Remedial Action Levels (RAL) for the Site." (p.50)
Fox River (Operating Units 3, 4, & 5)	ROD (June 2003)	The Screening Level Risk Assessment identified more than 75 chemicals of potential concern (COPCs). Based on further review of COPCs in fish tissue, the agencies determined they should carry forward only eight COPCs into the Baseline Human Health and Ecological Risk Assessment: PCBs, dioxins, furans, DDT/DDE/DDD, dieldrin, arsenic, lead, and mercury. All of these COPCs posed risk to at least one receptor group in at least one reach or zone at the Site. However, only PCBs, DDE, and mercury posed risk to all receptors--both human and ecological--in all areas to be evaluated. The agencies carried forward these three COPCs for evaluation in the Feasibility Study as COCs. (p.26) Consistent with EPA guidance, the agencies developed remedial action objectives (RAOs) for the protection of human health and the environment. "The RAOs specify the contaminants and media of concern, exposure routes and potential receptors, and an acceptable concentration limit or range for each contaminant for each of the various media, exposure routes, and receptors." The agencies used the RAOs to establish specific remedial action levels (RALs) for the Site. (p.71)
Commencement Bay (Operable Units 01, 05)	ROD (September 1989)	The human health and environmental risk assessments "were used in the remedial investigation to characterize the magnitude of risks associated with exposure to contaminated sediments and to prioritize areas within the . . . site for remedial action. The results of the risk assessments were also used in the feasibility study to develop sediment cleanup guidelines to protect human health and the environment." (p.34) Baseline human health risks were estimated for chemicals detected in fish and crab tissue samples from the CB/NT site and a reference area. These analyses were used to identify chemicals that accumulated in organism tissues and resulted in significant risks to seafood consumers. Chemicals posing significant risks were identified by calculating carcinogenic risk levels or by comparison with EPA's acceptable daily intake (ADI) values. Risks of seafood consumption at the CB/NT site were also compared with risks of seafood consumption in an uncontaminated reference area, Carr Inlet. Chemicals posing risk levels at the CB/NT site that were similar to those at the reference area were not considered for further site cleanup evaluation (i.e., it was not considered feasible to cleanup to less than reference levels). Biological samples were analyzed for more than 100 chemicals. Of those chemicals, 11 organic chemicals (including PCBs) were measured at sufficient frequencies and concentrations to be subjected to further analysis. Metals were present in all samples, but the concentrations were similar to levels measured in samples from the reference area. However, arsenic was included as a

		chemical of concern because it is a suspected human carcinogen. (p.35) Only six of these COCs exceeded the target cancer risk based on a consumption rate of 1 pound/day, and only PCBs and arsenic exceeded the target cancer risk based on a consumption rate of 1 pound/month. For non-carcinogens, three metals were present in concentrations that would exceed ADI values at a consumption rate of 1 pound/day. However, at that consumption rate, ADI values would also be exceeded for fish from the reference area. At a consumption rate of 0.5 pounds/day, the exposure for all three metals would be below ADI values. Due to the limited risk from non-carcinogens, those risks were not evaluated further in setting sediment cleanup levels. (p.36) "The baseline risk assessment . . . indicated that the most significant human health risks are associated with elevated PCBs in the tissues of resident seafood. Arsenic was not subjected to further evaluation relative to human health because of its lower risk level and because arsenic concentrations in CB/NT fish are similar to concentrations in fish from the reference area." (p.36) "The next step in the risk assessment was to evaluate the relationship between sediment contamination and fish tissue contamination so that a PCB cleanup level could be evaluated for its effectiveness in reducing risks to seafood consumers. . . . The calculation of a sediment cleanup level for PCBs to protect human health was established in relation to reference conditions, assuming that more stringent cleanup levels would be infeasible." (p.36) EPA concluded that "a PCB sediment cleanup level of 150 µg/kg would result in an average post-cleanup sediment concentration of 30 µg/kg for Hylebos Waterway or for the CB/NT site in general. This cleanup level would also result in attainment of fish PCB levels similar to those in Puget Sound reference areas." (p.37). This value (150 µg/kg) was subsequently revised by EPA in an Explanation of Significant Difference (ESD) to 300 µg/kg.
Lower Duwamish Waterway	Proposed Plan (February 2013)	The human health risk assessment (HHRA) analyzed contaminants of potential concern (COPCs) that were detected in sediments, fish, and shellfish at the Site in concentrations that exceeded risk-based screening criteria. EPA identified two exposure scenarios for evaluation in the HHRA: (1) consumption of residual seafood from the Site, and (2) direct contact with sediment. The HHRA did not analyze swimming risks because a previous study concluded the excess lifetime cancer risks from swimming were less than 1 in 1,000,000. (p.29) The HHRA identified PCBs, arsenic, cPAHs, and dioxins/furans as human health contaminants of concern (COCs). BEHP, pentachlorophenol, vanadium, tributyltin, and several pesticides were found at the Site in concentrations that exceeded risk thresholds; however, "they were <u>not selected as COCs</u> due to <u>low detection frequency</u>, low contribution to overall risk, or quality assurance concerns with analytical data." (p.31) (Emphasis added.) "PCPs, arsenic, PAHs, and dioxins/furans, along with the COCs identified by the Ecological Risk Assessment, were used to identify areas requiring cleanup in the FS. Other contaminants that exceeded risk thresholds but were not designated as COCs were still evaluated in the FS to ensure that a cleanup based on the COCs would also address risk due to these other contaminants." (p.33) The ecological risk assessment (ERA) determined that 41 contaminants presented risk to benthic invertebrates because their concentrations in surface sediments exceeded the sediment quality standard (SQS). For any sample that exceeded the SQS (or cleanup screening levels (CSL)) but did not exceed the biological criteria, the sample was designated as not exceeding the SQS (or CSL). The three COCs with the most frequent exceedances were PCBs, BEHP, and butyl benzyl phthalate. "<u>For all other COCs, exceedances occurred in 5% or less of the sediment samples</u>." (p.37) (Emphasis added.) "A subset of COCs were identified as ecological COCs to focus the evaluation of remedial alternatives for the [site]. Forty-one contaminants (including PCBs) were identified as COCs for benthic invertebrates, and PCBs were also identified as a COC for river otters." (p.38)

		"In accordance with the NCP, EPA developed Remedial Action Objectives (RAOs) to describe what the proposed cleanup is expected to accomplish to protect human health and the environment. The RAOs for the [site] are based on results of the human health and ecological risk assessments . . . . <u>RAOs help focus the development and evaluation of remedial alternatives and form the basis for establishing Preliminary Remediation Goals (PRGs) and the cleanup levels to be established in the ROD</u>." (p.43) (Emphasis added.) "PRGs are contaminant concentrations used in the FS to measure the success of the cleanup alternatives in meeting the RAOs. . . . <u>PRGs are refined into final contaminant-specific cleanup levels in the ROD</u>. EPA proposes to select the PRGs for sediment, surface water, and fish and shellfish described below as cleanup levels in the ROD, subject to consideration of public comment." (p.44) (Emphasis added.) EPA identified PRGs for the four human health COCs for both exposure scenarios (human seafood consumption and human direct contact), except EPA identified no PRGs for arsenic or cPAH for the human seafood consumption RAO. This is because the excess cancer risk from seafood consumption for these COCs was largely attributable to eating clams. Data collected during the RI/FS showed little relationship between arsenic or cPAH concentrations in sediment and concentrations in clam tissue. (p.46-47) Sediment PRGs were identified for each of the 41 ecological COCs. (p.47) Fish and shellfish tissue PRGs were identified for the four human health COCs. (p.48-49) For surface water, EPA identified a PRG for only PCBs. That PRG was based on the recommended Ambient Water Quality Criteria (AWQC). However, "[d]uring remedial design sampling, EPA intends to further evaluate surface water COC concentrations. If other COC surface water concentrations exceed the recommended Federal AWQC [...] or State Water Quality Standards, the more stringent of the two will be used to monitoring process towards achieving RAOs." (p.49)
Harbor Oil	ROD (June 2013)	The Harbor Oil Site was placed on the National Priority List in September 2003, primarily because wetland soils and sediments had elevated levels of PCBs. The RI report identified chemicals and/or chemical groups occurring at the Site at concentrations that approached or exceeded EPA's screening values. Chemicals were grouped based on the similarity of chemical properties and potential release sources: • TPHs, PAHs, and associated VOCs; • PCBs; • Metals; • DDT; and • Chlorinated solvents. Dioxins/furans were not analyzed in the RI because EPA's initial site inspection documented that they were not associated with activities conducted at the facility. (p.28-29) The HHRA examined five exposure scenarios: (1) industrial worker under RME scenario, (2) future outdoor worker RME scenario, (3) industrial/commercial worker vapor intrusion scenario, (4) Force Lake recreational user RME scenario, and (5) Force Lake fish consumer RME scenario. (p.45-46) All excess cancer risk estimates were within or less than EPA's acceptable cancer

		risk range. The hazard index was also less than or equal to EPA's threshold, except for the Force Lake consumer scenario. EPA concluded, however, that the risk from the Force Lake consumer scenario was overstated because no target organ/effects HIs were greater than 1. (p.45-46). EPA also performed a screening assessment regarding risks to hypothetical residential users of the Site and concluded the excess cancer risks would be above EPA's target threshold; however, because EPA does not consider residential use to be a reasonably likely future use scenario, EPA did not further analyze the residential use exposure scenario. (p.48) The ERA screened out COPCs with lower concentrations than their respective background values. The ERA examined the following receptors of concern: invertebrates, fish, birds, mammals. (p.48) The lowest observed adverse health effect level-based HQs were greater than one for at least one receptor for metals, DDD, DDE, total DDT, and HPAHs. However, "only DDE for aquatic invertebrates, copper and chromium for terrestrial invertebrates, and mercury for shrew had HQs greater than 10." Mercury concentrations were within the range of Oregon DEQ background concentrations, which indicated that although there was the potential for risk, it was not significantly elevated over reference values. In addition, "there was no evidence that terrestrial invertebrates were absent from the Site in areas with elevated copper and chromium values." (p.50) Through its uncertainty analysis, EPA concluded that risk from DDT/DDE/DDD would be limited because concentrations of total DDTs were less than the screening level and bioavailability would be limited because total organic carbon concentrations in sediment were high. (p.50). EPA determined the risks to terrestrial invertebrates were overstated because the soil screening levels are conservative thresholds intended for screening only. EPA determined the risks to fish were overstated because the potential for exposure to fish from shallow groundwater is low. EPA determined the risk to birds was overstated because the bioaccumulation factors do not take into account site-specific TOC concentrations. (p.51) EPA determined the risk to mammals was overstated because of the limited geographic extent of the relevant contamination at the Site. Moreover, the concentrations of mercury were not significantly above background concentrations. (p.52) EPA concluded that the Site did not pose an unacceptable risk and, therefore, that action under CERCLA is not warranted. (p.54) The ROD explained: "Although potential risks to ecological receptors exceeded screening levels and the associated hazard indices were estimated to be above a Hazard Index of 1, the calculated risks likely overestimate risks . . . . In addition, there are no endangered or threatened species present at the Site and the areas with elevated soil contaminants are too small and discontinuous to have any effect on receptor communities. Since releases from the Site do not pose any unacceptable risks to human health or the environment, EPA has determined that action under CERCLA is not warranted for this Site." (p.55) DEQ did not concur with the no-action remedy. (p.56)
Hudson River PCBs	ROD (February 2002)	PCBs are the sole chemical of concern identified in the ROD. (p.32) The HHRA analyzed two exposure pathways: fish consumption and recreation-based contact with sediment. (p.33-34). The cancer and non-cancer risks from fish consumption were above acceptable levels. (p.37-39) Two other exposure pathways--drinking water and air--were eliminated because the cancer and non-cancer risks were at or below EPA's goals for protection. (p.33-34). The ERA concluded that the ecological risks associated with ingestion of fish by birds, fish, and mammals were above acceptable levels under baseline conditions. (p.49) "Consistent with the NCP and RI/FS Guidance, EPA developed remedial action objectives (RAOs) for protection of human health and the environment. RAOs specify the contaminants and media of concern, exposure routes and potential receptors, and an acceptable concentration limit or range for each contaminant for each of the various media, exposure routes and receptors. RAOs

		were then used to establish specific preliminary remediation goals (PRGs) for the Site. PRGs were established after review of both the preliminary chemical-specific ARARs and risk-based concentrations and serve to focus the development of alternatives or remedial technologies that can achieve the remedial goals." (p.49) Consistent with the conclusions from the HHRA, EPA established a single RAO to protect human health: "Reduce the cancer risks and non-cancer health hazards for people eating fish from the Hudson River by reducing the concentration of PCBs in fish." EPA set a single PRG for this RAO: 0.05 mg/kg PCBs in fish fillet. For ecological risk to birds, fish, and mammals, EPA established a single RAO: "Reduce the risks to ecological receptors by reducing the concentration of PCBs in fish." EPA set a single PRG for this RAO: a range from 0.3 to 0.03 mg/kg PCBs in fish (largemouth bass, whole body). This PRG was considered protective of all the ecological receptors evaluated. (p.50) EPA adopted the PRGs as the final Remediation Goals for the Site. (p.51) The ROD included three other RAOs. The first was to reduce PCB levels in sediments in order to reduce PCB concentrations in river water that were above surface water ARARs (e.g., the federal MCL for drinking water, among others). (p.50) The other two RAOs did not lend themselves to the development of numeric PRGs: (1) reduce the inventory of PCBs in sediment that are or may be bioavailable, and (2) minimize the long-term downstream transport of PCBs in the river. No PRGs were provided for these RAOs. (p.51)
Fields Brook (Operable Unit 4)	ROD (June 1997)	The HHRA focused on 11 COCs that exceeded any of the Fields Brook sediment operable unit cleanup goals on average for any sediment exposure unit. Two of these COCs--hexachloroethane and vinyl chloride--were screened out as COCs in the HHRA because they were detected at a frequency of less than five percent. (p.12) The ROD set cleanup goals as the average concentration per area for each COC within the floodplain/wetlands area operable unit. (p.32)
Sangamo Weston / Twelve-Mile / Lake Hartwell (Operable Unit 2)	ROD (June 1994)	The baseline risk assessment focused only on PCBs as the COPC. Full-screen analyses of sediment and fish tissue samples were conducted and did not detect appreciable quantities of volatile organic compounds, semivolatile organic compounds, pesticides, and/or inorganics (metals). (p.50) Two human health exposure pathways were quantitatively examined: (1) ingestion and dermal absorption of PCBs in shallow sediment by a child and an adult, and (2) ingestion of PCB-contaminated fish by a recreational fisherman. (p.51) EPA concluded that adverse human health risks from direct contact within or incidental ingestion of sediment was unlikely to occur. However, EPA concluded that exposures associated with the ingestion of fish resulted in unacceptable risks. (p.54) Based on the risk assessment, EPA identified sediment as the media of concern. No cleanup goals were developed for surface water because PCBs were not detected above the detection limits. (p.66) EPA identified fish ingestion as the primary exposure pathway of concern. EPA considered three potential remediation goals for sediment: 1 mg/kg, 0.4 mg/kg, and 0.05 mg/kg. The ROD selected 1 mg/kg as the final cleanup goal. (p.67) EPA considered two different potential remediation goals for fish tissue: (1) the FDA tolerance level of 2 mg/kg for PCBs in the edible portion of fish (a contaminant-specific ARAR), and (2) risk-based levels that consider the fish ingestion exposure pathway. The risk-based goal would have resulted in a fish tissue concentration goal of 0.036 mg/kg to achieve a cancer risk of 1×10^{-4} or 0.0036 mg/kg to achieve a cancer risk of 1×10^{-6}. (p.68) EPA determined that the risk-based goals were "technically impracticable for several reasons," including the fact that reducing surface water and sediment concentrations to the levels necessary to achieve the goal was beyond the capability of proven treatment technology. (p.68-70)

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 1 (HH Direct Contact)						RAO 2 (HH Bioaccumulation)					
	Beach PRGs (µg/kg)			Sediment (µg/kg)			Tissue (µg/kg)			Sediment (µg/kg)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 11-Apr-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Persistent												
Total PCBs				370	C	The site use factor should be applied to in-water sediment PRGs for fishers (see Attachment 3, Issue Statement).	0.3	T,C	The target tissue level should be based on background, which is the basis for the sediment PRG.	6	C	The data used to determine background are not representative of reasonable background conditions in Portland Harbor (see Attachment 2).
Dioxin/Furan (2,3,7,8-TCDD Eq)				0.01	C	The site use factor should be applied to in-water sediment PRGs for fishers (see Attachment 3, Issue Statement).	0.000006	T		0.00003	C,F	It is not possible to model the TEQ, as it is a toxicity weighted value. For purposes of modeling, a single congener should be used. Tissue and sediment data should then be used to establish the relationship between the individual congener and the TEQ (see Attachment 3, Issue Statement).
Hydrocarbons												
Total cPAH (BaP Eq)	12	ND		106	C	The site use factor should be applied to in-water sediment PRGs for fishers (see Attachment 3, Issue Statement).	0.05	T,C	The target tissue level should be based on clam consumption, which is the basis for the sediment PRG.	4,000	C	PRG should be expressed on an organic carbon normalized basis (see Attachment 3, Issue Statement).
Total PAH												
Total LPAH												
Total HPAH												
TPH (C-10 to C-12 aliphatic/aromatic)												
Pesticides												

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 1 (HH Direct Contact)						RAO 2 (HH Bioaccumulation)					
	Beach PRGs (µg/kg)			Sediment (µg/kg)			Tissue (µg/kg)			Sediment (µg/kg)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 11-Apr-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Aldrin							0.06	RM	Aldrin was identified as posing unacceptable risk for clam consumption for a single river mile, which is insufficient to conclude a COC or PRG is necessary. Furthermore, the target tissue level should be based on clam consumption, as aldrin did not pose an unacceptable risk for fish consumption in the BHHRA.	0.6	RM	Aldrin was identified as posing unacceptable risk for clam consumption for a single river mile, which is insufficient to conclude a COC or PRG is necessary.
Dieldrin							0.06	T		0.1	F	
Total DDx							3	T		7	F	

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

EPA's Chemicals of Concern	RAO 1 (HH Direct Contact)						RAO 2 (HH Bioaccumulation)					
	Beach PRGs (µg/kg)			Sediment (µg/kg)			Tissue (µg/kg)			Sediment (µg/kg)		
	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 11-Apr-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
gamma-HCH (Lindane)												
Total Chlordanes							3	T		1	F	
2,4-D												
2,4,5-TP (Silvex)												
MCPP												
Metals												
Arsenic	3,000	ND		3,000	C	The site use factor should be applied to in-water sediment PRGs for fishers (see Attachment 3, Issue Statement).	0.001	T		NA	ND	

Table 2

Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 1 (HH Direct Contact)						RAO 2 (HH Bioaccumulation)					
	Beach PRGs (µg/kg)			Sediment (µg/kg)			Tissue (µg/kg)			Sediment (µg/kg)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 11-Apr-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Cadmium												
Chromium												
Copper												

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 1 (HH Direct Contact)						RAO 2 (HH Bioaccumulation)					
	Beach PRGs (µg/kg)			Sediment (µg/kg)			Tissue (µg/kg)			Sediment (µg/kg)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 11-Apr-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Lead												
Manganese												
Mercury							0.03	T		NA	ND	

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 1 (HH Direct Contact)						RAO 2 (HH Bioaccumulation)					
	Beach PRGs (µg/kg)			Sediment (µg/kg)			Tissue (µg/kg)			Sediment (µg/kg)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 11-Apr-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Vanadium												
Zinc												
Phthalates												
BEHP							70	RM	BEHP was identified as posing unacceptable risk only for whole body tribal fish consumption.	NA	ND	

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 1 (HH Direct Contact)						RAO 2 (HH Bioaccumulation)					
	Beach PRGs (µg/kg)			Sediment (µg/kg)			Tissue (µg/kg)			Sediment (µg/kg)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 11-Apr-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Butyltins												
TBT												

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 1 (HH Direct Contact)						RAO 2 (HH Bioaccumulation)					
	Beach PRGs (µg/kg)			Sediment (µg/kg)			Tissue (µg/kg)			Sediment (µg/kg)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 11-Apr-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
SVOCs												
1,2-Dichlorobenzene												
Hexachlorobenzene							0.6	T		0.2	C,F	The PRG for a multi-species diet should be the average of the PRGs for the individual species, not the reciprocal of the sum of the reciprocals.
Pentachlorophenol												
VOCs												
Benzene												
Chlorobenzene												
Chloroform												
1,1-Dichloroethene/1,1-Dichloroethylene (1,1-DCE)												

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 1 (HH Direct Contact)						RAO 2 (HH Bioaccumulation)					
	Beach PRGs (µg/kg)			Sediment (µg/kg)			Tissue (µg/kg)			Sediment (µg/kg)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 11-Apr-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
cis-1,2-Dichloroethene/cis-1,2-Dichloroethylene (c-1,2-DCE)												
trans-1,2-Dichloroethene/trans-1,2-Dichloroethylene (t-1,2-DCE)												
Ethylbenzene												
Tetrachloroethylene (PCE)												
Trichloroethylene (TCE)												
Toluene												

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 1 (HH Direct Contact)						RAO 2 (HH Bioaccumulation)					
	Beach PRGs (µg/kg)			Sediment (µg/kg)			Tissue (µg/kg)			Sediment (µg/kg)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 11-Apr-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
1,1,1- Trichloroethane (TCA)												
Vinyl chloride												
o-Xylene												
m- and p-Xylene												
Total Xylene												
Other												
PBDE							30	NE	Data limitations prevented a sufficiently accurate assessment of this potential risk. EPA developed this PRG for subsistence fish consumption, which was not evaluated in the BHHRA.	NA	ND	
Cyanide												
Perchlorate												

Table 2

Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 2 (HH Bioaccumulation) Surface Water (ug/L)			RAO 3 (HH Surface Water) Surface Water (ug/L)			RAO 4 (HH Groundwater) Groundwater (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Persistent									
Total PCBs	0.0000064	ND		0.5	NR	PCBs were not identified as a COPC in the BHHRA for surface water for any of the exposure scenarios.	0.5	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Dioxin/Furan (2,3,7,8-TCDD Eq)	0.00000000051	ND		0.00003	NR	Dioxins/furans were not identified as a COPC in the BHHRA for surface water for any of the exposure scenarios.	0.00003	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Hydrocarbons									
Total cPAH (BaP Eq)	0.0013	C	PRG should be based on Organism Only (0.0018 ug/L)	0.2	ND		0.2	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Total PAH									
Total LPAH	NA	NE	This chemical was not evaluated in the BHHRA.	0.14	NE	This chemical was not evaluated in the BHHRA.	0.14	NE	This chemical was not evaluated in the BHHRA.
Total HPAH	NA	NE	This chemical was not evaluated in the BHHRA.	0.2	NE	This chemical was not evaluated in the BHHRA.	0.2	NE	This chemical was not evaluated in the BHHRA.
TPH (C-10 to C-12 aliphatic/aromatic)									
Pesticides									

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

EPA's Chemicals of Concern	RAO 2 (HH Bioaccumulation) Surface Water (ug/L) EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	RAO 3 (HH Surface Water) Surface Water (ug/L) EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	RAO 4 (HH Groundwater) Groundwater (ug/L) EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Aldrin	0.000005	RM	Aldrin was identified as posing unacceptable risk for clam consumption for a single river mile, which is insufficient to conclude a COC or PRG is necessary.	0.004	NR	Risks were less than 1 x 10-6, and HQs were less than 1 from aldrin for divers and future domestic water use at all sample locations.			
Dieldrin	0.0000053	C	PRG should be based on Organism Only (0.0000054 ug/L)	0.0015	NR	Dieldrin was not identified as a COPC in the BHHRA for surface water for any of the exposure scenarios.			
Total DDx	0.000022[4]	ND		39[7]	NR	DDx was not identified as a COPC in the BHHRA for surface water for any of the exposure scenarios.	39[7]	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 2 (HH Bioaccumulation)			RAO 3 (HH Surface Water)			RAO 4 (HH Groundwater)		
	Surface Water (ug/L)			Surface Water (ug/L)			Groundwater (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
gamma-HCH (Lindane)	1.7	NR	Risks were less than 1 x 10-6 and HQs were less than 1 from gamma-HCH for all fish (and shellfish) consumption scenarios.	0.2	NR	Gamma-HCH was not identified as a COPC in the BHHRA for surface water for any of the exposure scenarios.	0.2	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Total Chlordanes	0.000081	ND		2	NR	Total chlordanes were not identified as a COPC in the BHHRA for surface water for any of the exposure scenarios.	2	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
2,4-D	100	NE	2,4-D (and other herbicides) were not analyzed for in tissue. 2,4-D was only detected in ~3% of the surface water samples.	70	NR	2,4-D was not identified as a COPC in the BHHRA for surface water for any of the exposure scenarios.	70	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
2,4,5-TP (Silvex)	10	NE	2,4,5-TP (and other herbicides) were not analyzed for in tissue. 2,4,5-TP was not detected in any of the surface water samples (n=174).	50	NR	2,4,5-TP was not detected in any surface water sample, and therefore, was not identified as a COPC in the BHHRA.	50	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
MCPP	NA	ND		12	RM	MCPP resulted in a HQ of 2 at one sample location for future domestic water use. This insufficient to determine it is a COC.			
Metals									
Arsenic	2.1[5]	ND		10	ND		10	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 2 (HH Bioaccumulation) Surface Water (ug/L)			RAO 3 (HH Surface Water) Surface Water (ug/L)			RAO 4 (HH Groundwater) Groundwater (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Cadmium									
Chromium	NA	ND		100	RM	Hexavalent chromium, not total chromium, resulted in a risk of 7 x 10-6 at one location for future domestic water use. This is insufficient to conclude it is a COC.	100	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Copper									

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 2 (HH Bioaccumulation)			RAO 3 (HH Surface Water)			RAO 4 (HH Groundwater)		
	Surface Water (ug/L)			Surface Water (ug/L)			Groundwater (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Lead									
Manganese	NA	ND		320	NE	Manganese was not analyzed for in surface water.	320	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Mercury	4.3	C	Mercury is not listed in OR Table 40.						

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA’s April 11, 2014 Preliminary Remediation Goals

	RAO 2 (HH Bioaccumulation) Surface Water (ug/L)			RAO 3 (HH Surface Water) Surface Water (ug/L)			RAO 4 (HH Groundwater) Groundwater (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Vanadium									
Zinc							4,700	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Phthalates									
BEHP	0.2	RM	BEHP was identified as posing unacceptable risk only for whole body tribal fish consumption.	6	NR	BEHP was not identified as a COPC in the BHHRA for surface water for any of the exposure scenarios.			

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA’s April 11, 2014 Preliminary Remediation Goals

	RAO 2 (HH Bioaccumulation) Surface Water (ug/L)			RAO 3 (HH Surface Water) Surface Water (ug/L)			RAO 4 (HH Groundwater) Groundwater (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Butyltins									
TBT									

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 2 (HH Bioaccumulation) Surface Water (ug/L)			RAO 3 (HH Surface Water) Surface Water (ug/L)			RAO 4 (HH Groundwater) Groundwater (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
SVOCs									
1,2-Dichlorobenzene	110	NR	1,2-Dichlorobenzene was not detected in any of the fish or shellfish tissue samples (n = 253).	600	NR	1,2-Dichlorobenzene was not detected in any surface water sample (n=200).	600	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Hexachlorobenzene	0.000029	ND		1	NR	Hexachlorobenzene was not identified as a COPC in the BHHRA for surface water for any of the exposure scenarios.	1	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Pentachlorophenol	0.15	RM	Pentachlorophenol was identified as posing unacceptable risk for crayfish consumption based on a single sample, which is insufficient to conclude a COC or PRG is necessary.	1	NR	Pentachlorophenol was not detected in any surface water sample (n=173).	1	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
VOCs									
Benzene	0.44	NE	VOCs were not analyzed for in tissue.	5	NE	VOCs were not analyzed for in surface water.	5	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Chlorobenzene	74	NE	VOCs were not analyzed for in tissue.	100	NE	VOCs were not analyzed for in surface water.	100	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Chloroform	260	NE	VOCs were not analyzed for in tissue.	80	NE	VOCs were not analyzed for in surface water.	80	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
1,1-Dichloroethene/1,1-Dichloroethylene (1,1-DCE)	230	NE	VOCs were not analyzed for in tissue.	7	NE	VOCs were not analyzed for in surface water.	7	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 2 (HH Bioaccumulation)			RAO 3 (HH Surface Water)			RAO 4 (HH Groundwater)		
	Surface Water (ug/L)			Surface Water (ug/L)			Groundwater (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
cis-1,2-Dichloroethene/cis-1,2-Dichloroethylene (c-1,2-DCE)	NA	NE	VOCs were not analyzed for in tissue.	70	NE	VOCs were not analyzed for in surface water.	70	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
trans-1,2-Dichloroethene/trans-1,2-Dichloroethylene (t-1,2-DCE)	120	NE	VOCs were not analyzed for in tissue.	100	NE	VOCs were not analyzed for in surface water.	100	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Ethylbenzene	160	NE	VOCs were not analyzed for in tissue.	700	NE	VOCs were not analyzed for in surface water.	700	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Tetrachloroethylene (PCE)	0.24	NE	VOCs were not analyzed for in tissue.	5	NE	VOCs were not analyzed for in surface water.	5	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Trichloroethylene (TCE)	1.4	NE	VOCs were not analyzed for in tissue.	5	NE	VOCs were not analyzed for in surface water.	5	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Toluene	720	NE	VOCs were not analyzed for in tissue.	1,000	NE	VOCs were not analyzed for in surface water.	1,000	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 2 (HH Bioaccumulation) Surface Water (ug/L)			RAO 3 (HH Surface Water) Surface Water (ug/L)			RAO 4 (HH Groundwater) Groundwater (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
1,1,1- Trichloroethane (TCA)	NA	NE	VOCs were not analyzed for in tissue.	200	NE	VOCs were not analyzed for in surface water.	200	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Vinyl chloride	0.023	NE	VOCs were not analyzed for in tissue.	2	NE	VOCs were not analyzed for in surface water.	2	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
o-Xylene	NA	NE	VOCs were not analyzed for in tissue.	190	NE	VOCs were not analyzed for in surface water.	190	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
m- and p-Xylene	NA	NE	VOCs were not analyzed for in tissue.	NA	NE	VOCs were not analyzed for in surface water.	NA	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Total Xylene	NA	NE	VOCs were not analyzed for in tissue.	10,000	NE	VOCs were not analyzed for in surface water.	10,000	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Other									
PBDE	NA	ND		NA	ND				
Cyanide	130[11]	NE	Cyanide was not analyzed for in tissue.	200	NE	Cyanide was not analyzed for in surface water.	200	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.
Perchlorate	NA	ND		15	NR	HQs were less than 1 from perchlorate for divers, which was the only surface water scenario where perchlorate was identified as a COPC.	15	NE	Groundwater was not evaluated in the BHHRA. Also, no unacceptable risk was found in shoreline seeps.

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 5 (Eco Sediment)			RAO 6 (Eco Bioaccumulation)					
	Sediment (µg/kg)			Sediment (µg/kg)			Surface Water (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Persistent									
Total PCBs	126	C	The Total PCB SQV based on the site-specific toxicity FPM are 3,500 µg/kg dw for three of four endpoints and 500 µg/kg dw for the fourth endpoint (Chironomus biomass). The level 2 and 3 SQVs are the same. The total PCB SQVs based on the site-specific LRM (pooled endpoint) are 1,600 and 1,100 µg/kg fines (L3 and L2 respectively). The generic PEC is 676 µg/kg dw. Therefore, 126 µg/kg dw is presumably based on a bioaccumulation endpoint, which means that it belongs under RAO 6 (Eco Bioaccumulation), not RAO 5. Because we already have a lower RAO 6 PRG, this one is unnecessary and should be dropped.	40	C	This PRG should be 79 µg/kg dw, which is the lower confidence limit on the sediment concentration associated with a population-level effect on mink. The analysis was presented in Draft FS Appendix E, Attachment 1-A and has since been published in the peer-reviewed scientific literature. EPA has not provided any comments or objections to the assessment that supports the 79 µg/kg dw PRG.	0.014	C	The RAO 6 surface water PRG is an AWQC that should be superseded by the site-specific risk-based sediment PRG, which is based on a bioaccumulation model that accounts for both sediment and water exposure.
Dioxin/Furan (2,3,7,8-TCDD Eq)				0.054	C	The PRG is a 2,3,4,7,8-PeCDF concentration. The TEQ concentration associated with the PRG should be calculated by dividing the PeCDF PRG by the location-specific TEF-weighted fractional contribution of 2,3,4,7,8-PCDF to the TEQ (see Attachment 3, Issue Statement, for details).			
Hydrocarbons									
Total cPAH (BaP Eq)									
Total PAH	23,000	BT	This is a generic sediment quality guideline (SQG), specifically a PEC. Use of individual benthic SQVs and SQGs is not consistent with the revised comprehensive benthic risk approach (CBRA) as recently provided by EPA.	NA	NR	Total PAHs is a contaminant of ecological significance due to potentially unacceptable risk to the benthic community, not fish and wildlife. It should not be an RAO 6 COC, and so should not receive an NA designation here.			
Total LPAH	1,600	BT	This is the L2 Hyalella biomass SQV from the FPM. Use of individual benthic SQVs and SQGs is not consistent with the revised CBRA as recently provided by EPA. The use of this particular individual SQV is inconsistent with the CBRA for a another reason as well. It is a L2 Hyalella biomass SQV. The CBRA acknowledges the low reliability of the L2 Hyalella biomass SQVs.						
Total HPAH	150,000 (µg/kg-%fines)	BT	This is an LRM SQV. Use of individual benthic SQVs and SQGs is not consistent with the revised CBRA as recently provided by EPA.						
TPH (C-10 to C-12 aliphatic/aromatic)	11,000	RM	The LWG has not been able to determine the basis for this PRG. However, TPH SQVs were not evaluated based on the benthic tissue LOE so it presumably is intended to be based on an individual SQV or SQG. Use of individual benthic SQVs and SQGs is not consistent with the revised CBRA as recently provided by EPA. Moreover, TPH (C10-C12) exceeded potentially unacceptable risk thresholds only for TZW, so there is no basis for an RAO 5 PRG.						
Pesticides									

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 5 (Eco Sediment)			RAO 6 (Eco Bioaccumulation)					
	Sediment (µg/kg)			Sediment (µg/kg)			Surface Water (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Aldrin	40	RM	There are no SQVs or SQGs for aldrin in the BERA. This appears to be a dietary dose TRV for shorebird (0.040 mg aldrin/kg bodyweight-day) that has been mislabeled a sediment PRG. If so, then it is an invalid PRG. Also, EPA did not identify aldrin as a contaminant of ecological significance in the BERA, so no PRG should be needed.	NA	NR	EPA did not identify aldrin as an additional contaminant of ecological significance. It only came through as a contaminant posing potentially unacceptable risk based on one out of 84 samples exceeding a TRV for spotted sandpiper (HQ for that one sample = 1.7), so it should not have an RAO 6 NA designation (or PRG).			
Dieldrin	6.7	RM	There is the PEL for dieldrin. It is an order of magnitude lower than the other generic SQG (the PEC), indicating that it is probably over-conservative even as a screening value. Use of individual benthic SQVs and SQGs is not consistent with the revised CBRA as recently provided by EPA. Dieldrin was included in the FPM. The FPM was unable to distinguish Level 2 and 3 SQVs due to the limited dataset. Both SQVs were set at 21.5 µg/kg dw for all four bioassay endpoints. The station in the bioassay dataset with a sediment dieldrin concentration of 21.5 µg/kg dw was non-toxic (no Level 2 or Level 3 hits for any endpoint). The only sediment dieldrin concentration in the bioassay dataset that was higher was more than an order of magnitude higher (356 µg/kg dw) and had Level 3 hits for all four bioassay endpoints. However, it is unknown whether the toxicity at that station was due to dieldrin exposure, so the only valid conclusion from the bioassay dataset is that dieldrin might be toxic to benthic invertebrates at some concentration in the high tens to low hundreds of µg/kg dw. The FPM SQV of 21.5 µg/kg dw was only exceeded in 2 of 846 sediment samples, at stations between RM 8 and 9 where the preponderance of evidence (based on the comprehensive benthic approach) did not identify potentially unacceptable benthic community risk. In light of these facts, the LWG cannot concur with or support EPA's identification of dieldrin as a contaminant of ecological significance for the Portland Harbor RI/FS.						
Total DDx	573	BT	Use of individual benthic SQVs and SQGs is not consistent with the revised CBRA as recently provided by EPA.	NA	NR	DDx was identified as a COC based on potentially unacceptable risk to the benthic community. It is not an RAO 6 COC and should not have an NA designation.	0.001[7]	NR	The RAO 6 surface water PRG is an AWQC based on the protection of brown pelican via ingestion of contaminated prey. The BERA found no risk to piscivorous birds from exposure to DDx (and negligible risk to spotted sandpiper over a limited spatial extent) so a PRG is unwarranted. The only receptor with a sum DDE or total DDx HQ >1 is the spotted sandpiper population (max HQ = 1.5). HQ >1.0 in only one of four exposure areas (RM 7.0 to RM 9.0) based on worm only diet; clam-only or mixed diet max HQ <1.0. The selected LOAEL was consistent with the lowest literature-based LOAEL where mallard eggshell thinning of about 6% was statistically different from control. However, reproductive effects in field populations of birds has not been documented for eggshell thinning of <15 to 20%. The RAO 6 DDx surface water PRG should be dropped.

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 5 (Eco Sediment)			RAO 6 (Eco Bioaccumulation)					
	Sediment (µg/kg)			Sediment (µg/kg)			Surface Water (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
gamma-HCH (Lindane)	1.4	RM	Use of individual benthic SQVs and SQGs is not consistent with the revised CBRA as recently provided by EPA. Moreover, the only LOEs that identified lindane as poing potentially unacceptable risks are the sediment screening levels (i.e., PEC and PEL). Neither LWG nor EPA identified lindance as a predictor of benthic toxicity using the site-specific bioassay dataset, so no FPM or LRM SQVs were developed for lindane. PECs and PELs should not be used as the basis for risk management decision-making, particularly at a site such as Portland Harbor where so much work has gone into developing site-specific benthic risk assessment tools; they are instead screening values. The false positive prediction rates for PECs ranged from 28 to 36% (across the four endpoints, Level 2 toxicity) and 29 to 33% Level 3). The false positive prediction rates for the PELs were 49 to 54% (Level 2) and 48 to 51% (Level 3). The BERA clearly does not support EPA's decision to include lindane as a contaminant of ecological significance for the Portland Harbor RI/FS. It is wrong for EPA to revert to the use of generic sediment screening values to inform its risk managers, particularly after the years of work that have gone into developing a site-specific BERA for the benthic community and a comprehensive benthic approach for the Portland Harbor FS.						
Total Chlordanes	8.9	RM	Use of individual benthic SQVs and SQGs is not consistent with the revised CBRA as recently provided by EPA. Moreover, neither total chlordanes, nor any individual chlordane isomer was among the chemicals that provided predictive accuracy in the FPM, so chlordanes were not used in the FPM. Total chlordanes were not among the contaminants modeled using the LRM, but cis-chlordane was. Cis-chlordane exceeded the LRM Level 3 SQV in 5 of 851 samples primarily between RM 7.1 and RM 7.4 in Benthic Risk Area 14-3, coincident with DDx exceedances. Given the limited spatial extent of their potentially unacceptable risk and occurrence within the footprint of other organochlorine compounds (DDx), total chlordane do not fit the definition of a contaminant of ecological significance.						
2,4-D									
2,4,5-TP (Silvex)									
MCPP									
Metals									
Arsenic									

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 5 (Eco Sediment)			RAO 6 (Eco Bioaccumulation)					
	Sediment (µg/kg)			Sediment (µg/kg)			Surface Water (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Cadmium	3500	RM, BT	Cadmium was not included in EPA's site-specific Linear Regression Model (LRM), indicating that EPA did not find cadmium to be a useful predictor of sediment toxicity. The proposed Cd PRG was exceeded in just 7 out of 1,126 sediment samples. This is the Cd PEL. Use of individual benthic SQVs and SQGs is not consistent with the revised CBRA as recently provided by EPA.	NA	RM	The preponderance of evidence presented in the BERA strongly contradicts EPA's decision to list cadmium as an "additional contaminant of ecological significance." The BERA identified no potentially unacceptable cadmium risk to wildlife. The limited evidence for potentially unacceptable risk to fish does not warrant Cd as a COC and should not have an NA designation for RAO 6. The discordance of the dietary LOE with the surface water and tissue-residue LOEs (both of which indicate no risk) should alone be a strong enough reason not to consider cadmium as a contaminant of ecological significance for fish. The cadmium AWQC is based on a very large dataset and thus is the strongest LOE.			
Chromium	90,000	BT	This is the Cr PEL. Use of individual benthic SQVs and SQGs is not consistent with the revised CBRA as recently provided by EPA.						
Copper	165,000	RM	This LWG hasn't been able to determine the basis for this PRG. It is none of the Cu SQVs or SQGs. If it is an individual chemical SQV or SQG, it should not be used as a PRG because use of individual benthic SQVs and SQGs is not consistent with the revised CBRA as recently provided by EPA. Moreover copper should not have been identified as a benthic invertebrate contaminant of ecological significance because of the low magnitude of the TRV exceedance (maximum HQ = 2.6), and weakness of the tissue-residue LOE for inorganic metals (because invertebrates sequester copper and in the case of crayfish, copper forms the basis of their hemoglobin)	NA	RM	The weakness of the tissue-residue LOE, an overly conservative fish diet TRV, the discordance of the tissue and dietary LOEs with the stronger water LOE, and the similarity of Study Area and upriver fish tissue concentrations indicate that copper is not an ecologically significant contaminant for fish. The conservative TRV, conservative exposure estimates, and low HQs indicate that copper is not an ecologically significant contaminant for birds. So, in summary, the preponderance of evidence presented in the BERA strongly contradicts EPA's decision to list copper as a contaminant of ecological significance. It does not warrant being an RAO 6 COC or an NA designation here.			

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 5 (Eco Sediment)			RAO 6 (Eco Bioaccumulation)					
	Sediment (µg/kg)			Sediment (µg/kg)			Surface Water (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Lead	96,000	C, BT	The source of this PRG is unknown. It is not the PEC or PEL and it is lower than EPA's site-specific lead SQGs derived from its LRM (196,000 for L2 and 251,000 for L3).						
Manganese									
Mercury	NA	NR	The LWG does not agree mercury is an RAO 5 COC, and so it does not require an NA designation. Mercury poses potentially unacceptable risk based on the dietary LOE for sculpin, but EPA's basis for identifying it as posing potentially unacceptable risk was that the dietary TRV was exceeded in 1 of 1,345 sediment samples (< 0.001%) and in no tissue samples.	NA	RM	The fish diet LOE does not warrant the inclusion of mercury as a contaminant of ecological significance because the dietary TRV was exceeded in only 1 of 1,345 sediment samples and in no tissue samples. The kingfisher diet LOE does not warrant the inclusion of mercury as a contaminant of ecological significance because the dietary TRV was exceeded in only 1 of 1,345 sediment samples and in 1 of 128 prey tissue samples, and the maximum kingfisher diet HQ was low (1.0). Risks from mercury to upper-trophic-level receptors (i.e., fish, birds, or mammals) in the Study Area are negligible, indicating that mercury biomagnification does not support the identification of mercury as a contaminant posing ecologically significant risk. Mercury should not be an RAO 6 COC, and it does not warrant an NA designation.			

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 5 (Eco Sediment)			RAO 6 (Eco Bioaccumulation)					
	Sediment (µg/kg)			Sediment (µg/kg)			Surface Water (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Vanadium									
Zinc	315,000	BT	This is the Zn PEL. Use of individual benthic SQVs and SQGs is not consistent with the revised CBRA as recently provided by EPA.						
Phthalates									
BEHP	148,000	RM	The source of this PRG is unknown. BEHP was not included in the FPM or LRM and there is no PEC or PEL. A PRG based on the benthic invertebrate tissue LOE is unwarranted based on the low magnitude of exceedance for benthic invertebrate TRV (maximum HQ = 2.8) and the absence of a relationship between concentrations in co-located sediment and tissue samples	NA	RM	Taking into account the low frequency of surface water and tissue TRV exceedances, the conservatism of the fish tissue TRV, the absence of a relationship between Study Area sediment and tissue concentrations, and the absence of evidence of BEHP biomagnification, EPA's selection criteria for contaminants of ecological significance do not support its decision to identify BEHP as a contaminant of ecological significance. It does not warrant an RAO 6 NA designation (or PRG).			

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

EPA's Chemicals of Concern	RAO 5 (Eco Sediment) Sediment (µg/kg) EPA's PRG - 4-11-14	RAO 5 (Eco Sediment) Sediment (µg/kg) LWG Category of Disagreement	RAO 5 (Eco Sediment) Sediment (µg/kg) Summary of Disagreement Rationale	RAO 6 (Eco Bioaccumulation) Sediment (µg/kg) EPA's PRG - 4-11-14	RAO 6 (Eco Bioaccumulation) Sediment (µg/kg) LWG Category of Disagreement	RAO 6 (Eco Bioaccumulation) Sediment (µg/kg) Summary of Disagreement Rationale	RAO 6 (Eco Bioaccumulation) Surface Water (ug/L) EPA's PRG - 4-11-14	RAO 6 (Eco Bioaccumulation) Surface Water (ug/L) LWG Category of Disagreement	RAO 6 (Eco Bioaccumulation) Surface Water (ug/L) Summary of Disagreement Rationale
Butyltins									
TBT	4,000	RM	The basis for this PRG is unknown. Presumably it is back-calculated from the tissue residue TRV using the bioaccumulation regression model for TBT, which though it had a "moderate" r^2 value is highly uncertain because it was highly influenced by the one high value in the dataset. So, predicted tissue residues are uncertain and not supported by empirical data. The tissue TRV was exceeded only at one location, and the TRV is uncertain due to the inclusion of imposex—the endpoint that defined the lower distribution of the SSD, which set the TRV. For these reasons, TBT does not warrant an RAO 5 PRG.	NA	RM	TBT was identified as posing potentially unacceptable risk to the sculpin population based on the dietary LOE. Only 1 of the 81 sculpin prey samples (worms exposed in the laboratory to a sediment sample from the mouth of Swan Island Lagoon) resulted in a dietary HQ approaching 1.0. The HQ for that sample was 0.97. When combined with sediment ingestion, the sculpin dietary HQ for that sampling station was 1.0. Field conditions might not be accurately represented by tissue contaminant concentrations in laboratory tests because of the physical manipulation of sediment and possible changes in the chemical form affecting bioavailability and uptake. No field samples of sculpin prey exceeded the dietary TRV. An HQ of 1.0 is only achieved if one assumes that the sculpin's diet is composed solely of laboratory-exposed worms (from the single station that had the maximum TBT concentration). The mixed-diet risk estimate for sculpin resulted in a no-risk conclusion. On the effects side, the sculpin TBT dietary TRV is uncertain and conservative because the same experiment that was used to set the TRV produced a lesser effect at a higher dose. The only other evidence of potentially unacceptable risk from the exposure of sculpin to TBT comes from predicted dietary exposure. A statistical relationship was found between laboratory-exposed worm tissue and sediment TBT concentrations. The relationship was moderately strong (r^2 = 0.66), but this was driven primarily by a single data point with high leverage. The inclusion of a high-leverage data point calls into question the underlying assumptions for regression analysis. So, the predicted dietary LOE has all of the uncertainties and biases previously described for the measured dietary LOE, plus the uncertainty about the questionable regression relationship between laboratory-exposed worms and sediment. This is a highly unreliable LOE. Its predictions of potentially unacceptable dietary risk are not supported by empirical evidence from Portland Harbor field samples. It should not be used as the basis for identifying TBT as a contaminant of ecological significance.			

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 5 (Eco Sediment)			RAO 6 (Eco Bioaccumulation)					
	Sediment (µg/kg)			Sediment (µg/kg)			Surface Water (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
SVOCs									
1,2-Dichlorobenzene									
Hexachlorobenzene									
Pentachlorophenol									
VOCs									
Benzene									
Chlorobenzene									
Chloroform									
1,1-Dichloroethene/1,1-Dichloroethylene (1,1-DCE)									

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 5 (Eco Sediment)			RAO 6 (Eco Bioaccumulation)					
	Sediment (µg/kg)			Sediment (µg/kg)			Surface Water (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
cis-1,2-Dichloroethene/cis-1,2-Dichloroethylene (c-1,2-DCE)									
trans-1,2-Dichloroethene/trans-1,2-Dichloroethylene (t-1,2-DCE)									
Ethylbenzene									
Tetrachloroethylene (PCE)									
Trichloroethylene (TCE)									
Toluene									

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 5 (Eco Sediment)			RAO 6 (Eco Bioaccumulation)					
	Sediment (µg/kg)			Sediment (µg/kg)			Surface Water (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
1,1,1- Trichloroethane (TCA)									
Vinyl chloride									
o-Xylene									
m- and p-Xylene									
Total Xylene									
Other									
PBDE									
Cyanide									
Perchlorate									

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

EPA's Chemicals of Concern	RAO 7 (Eco Surfacewater) Surface Water (ug/L) EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	RAO 8 (Eco Groundwater) Pore Water (ug/L) EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Persistent						
Total PCBs	0.19	ND		NA	ND	
Dioxin/Furan (2,3,7,8-TCDD Eq)	0.00038	NR	Was not found to be a surface water COPC in the BERA (surface water TRV not exceeded).	NA	ND	
Hydrocarbons						
Total cPAH (BaP Eq)						
Total PAH	NA	ND		Note 6	C	Not appropriate to apply a surface water TRV as a TZW PRG (exposure pathway is not complete and significant)
Total LPAH	12	NE	Total LPAH was not used to assess surface water risk in the BERA. This is a naphthalene Tier II value.	12	NE	PRGs should be based on COPCs evaluated in the BERA (i.e., individual PAHs for TZW)
Total HPAH	0.014	NE	Total HPAH was not used to assess surface water risk in the BERA. This is a benzo(a)pyrene Tier II value.	0.014	NE	PRGs should be based on COPCs evaluated in the BERA (i.e., individual PAHs for TZW)
TPH (C-10 to C-12 aliphatic/aromatic)				2.6	C	Not appropriate to apply a surface water TRV as a TZW PRG (exposure pathway is not complete and significant)
Pesticides						

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

EPA's Chemicals of Concern	RAO 7 (Eco Surfacewater) Surface Water (ug/L)			RAO 8 (Eco Groundwater) Pore Water (ug/L)		
	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Aldrin	1.5	NR	No unacceptable risk was found in surface water (aldrin did not pass through the SLERA) and was not determined to be of ecological significance.			
Dieldrin	0.056	NR	No unacceptable risk was found in surface water (dieldrin did not pass through the SLERA).			
Total DDx	0.011	ND		0.011	C	Not appropriate to apply a surface water TRV as a TZW PRG (exposure pathway is not complete and significant)

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 7 (Eco Surfacewater) Surface Water (ug/L)			RAO 8 (Eco Groundwater) Pore Water (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
gamma-HCH (Lindane)	0.08	NR	No unacceptable risk was found in surface water (it did not pass through the SLERA).	NA	NR	Not a TZW COPC
Total Chlordanes	0.0043	NR	No unacceptable risk was found in surface water (it did not pass through the SLERA).	NA	NR	Not a TZW COPC.
2,4-D	NA	NR	Not a BERA COPC.	NA	NR	Not a TZW COPC.
2,4,5-TP (Silvex)	NA	NR	Not a BERA COPC.	NA	NR	Not a TZW COPC.
MCPP						
Metals						
Arsenic	190[1]	NR	No potentially unacceptable risk was found in surface water; As was not a surface water COPC (did not pass through the SLERA).	NA	NR	Not a TZW COPC.

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 7 (Eco Surfacewater) Surface Water (ug/L)			RAO 8 (Eco Groundwater) Pore Water (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Cadmium	0.09	NR	No potentially unacceptable risk was found in surface water; Cd was not a surface water COPC (did not pass through the SLERA).			
Chromium	11[2,8]	NR	No potentially unacceptable risk was found in surface water; Cr was not a surface water COPC (did not pass through the SLERA).	NA	NR	Not a TZW COPC.
Copper	2.74	NR	No potentially unacceptable risk was found in surface water; Cu was not a surface water COPC (did not pass through the SLERA).			

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 7 (Eco Surfacewater)			RAO 8 (Eco Groundwater)		
	Surface Water (ug/L)			Pore Water (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Lead	0.54[8,9]	NR	No potentially unacceptable risk was found in surface water; Pb was not a surface water COPC (did not pass through the SLERA).	0.54	RM	Max HQ <100 (2.8). 100 should be the threshold because a factor of at least 10 should be applied to account for the evidence that benthic receptors are not directly exposed to undiluted TZW due to their feeding habits (refer to BERA Section 6.3.3) and an additional factor of 10 should be applied to account for the control of COPC sources because EPA guidance states that remedies should be evaluated under the assumption that sources of COPCs to the groundwater plume have been controlled.
Manganese				120	RM	The RI provides good evidence that TZW Mn is in equilibrium with the minerals in which it was measured, and that the changing water chemistry above the RPD (where benthic organisms would be exposed) will cause Mn to precipitate out. Also, the PRG should be updated to reflect more recently developed ecotoxicological data, it should be adjusted to reflect the hardness of TZW, and a PRG multiplier of at least 10 should be applied to account for the mechanisms employed by a wide range of benthic infauna to avoid direct exposure to undiluted pore water (as presented in the BERA, Section 6.3.3). An additional factor of 10 should be applied to account for future source control because EPA guidance states that remedies should be evaluated under the assumption that sources of COPCs to the groundwater plume have been controlled.
Mercury	0.012[8]	NR	No potentially unacceptable risk was found in surface water; Hg was not a surface water COPC (did not pass through the SLERA).	NA	NE	Not a TZW COPC

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 7 (Eco Surfacewater) Surface Water (ug/L)			RAO 8 (Eco Groundwater) Pore Water (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Vanadium				20	RM	Vanadium exceeded the water TRV 6 of the 13 samples collected from the Siltronic sampling area. The maximum vanadium TZW HQ was 13. Only those COPCs with an HQ ≥100 will be considered when identifying TZW contaminants of ecological significance. A factor of at least 10 should be applied to account for the evidence that benthic receptors are not directly exposed to undiluted TZW due to their feeding habits (refer to BERA Section 6.3.3). An additional factor of 10 should be applied to account for the control of COPC sources because EPA guidance states that remedies should be evaluated under the assumption that sources of COPCs to the groundwater plume have been controlled.
Zinc	33[8]	NR	Zinc exceeded the water TRV in 1 of 91 near-bottom surface water samples with HQ = 1.1. Zinc sediment concentrations were not correlated with bioassay toxicity, so zinc was not included in either the FPM or the LRM. No relationship between zinc concentrations in sediment and benthic or fish tissue was identified. Zinc is an essential nutrient and tissue zinc concentrations were all within a factor of 3 or less of the nutritional threshold provided by EPA, indicating that zinc concentrations are within the range that organisms are able to regulate. These facts are sufficient to strongly refute EPA's identification of Zn as a contaminant of ecological significance. Zinc is not useful for evaluating the risk reduction associated with potential sediment remedies because neither toxicity nor tissue residues are correlated with sediment chemistry, and the tissue residues in Portland Harbor samples are fully consistent with the bioregulation of zinc as an essential nutrient.	36.5	RM	Zinc exceeded the water TRV in only one TZW sample (max HQ = 14). Based on the evidence provided in the BERA, it does not warrant a surface water PRG (see RAO 7 Summary opf Disagreement Rationale), so there is no complete and significant exposure pathway.
Phthalates						
BEHP	3	NR	The evidence does not warrant the identification of BEHP as a contaminant of ecological significance for the Portland Harbor RI/FS. First, no relationships between tissue and sediment concentrations were identified, so it is not possible to evaluate the effectiveness of remedial alternatives at reducing risk, beyond offering risk managers the observation that tissue concentrations do not appear to be driven by sediment contamination. The surface water TRV for BEHP was only exceeded in 2 of 190 samples, indicating that BEHP exposure concentrations for aquatic life are very likely to be at concentrations below the TRV. The benthic tissue TRV was exceeded in 1 of the 35 field clam samples, with an HQ of 2.8. The fish tissue TRV for BEHP was exceeded in 2 of the 38 sculpin samples and 4 of the 31 smallmouth bass samples. Only one BEHP toxicity study was identified, and the LWG considered that study to be unacceptable for deriving a TRV because tissue residues were measured 20 days after effects were observed and the effects were not correlated with tissue residue concentrations. Nonetheless, the study was used to derive a tissue TRV (1.6 mg/kg ww) per EPA direction.			

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

EPA's Chemicals of Concern	RAO 7 (Eco Surfacewater) Surface Water (ug/L)			RAO 8 (Eco Groundwater) Pore Water (ug/L)		
	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
Butyltins						
TBT	0.063	NR	No potentially unacceptable risk was found in surface water (did not pass through the surface water SLERA).			

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

EPA's Chemicals of Concern	RAO 7 (Eco Surfacewater) Surface Water (ug/L) EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	RAO 8 (Eco Groundwater) Pore Water (ug/L) EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
SVOCs						
1,2-Dichlorobenzene	14	NR	No potentially unacceptable risk was found in surface water (did not pass through the surface water SLERA).	14	ND	
Hexachlorobenzene	NA	NR	No potentially unacceptable risk was found in surface water (did not pass through the surface water SLERA).	NA	NE	Not a TZW COPC.
Pentachlorophenol	13[3]	NR	No potentially unacceptable risk was found in surface water (did not pass through the surface water SLERA).	NA	NE	Not a TZW COPC.
VOCs						
Benzene				130	RM	Max HQ <100 (30). 100 should be the threshold because a factor of at least 10 should be applied to account for the evidence that benthic receptors are not directly exposed to undiluted TZW due to their feeding habits (refer to BERA Section 6.3.3); an additional factor of 10 should be applied to account for the control of COPC sources because EPA guidance states that remedies should be evaluated under the assumption that sources of COPCs to the groundwater plume have been controlled.
Chlorobenzene	50	NR	No potentially unacceptable risk was found in surface water (did not pass through the surface water SLERA).	64	ND	
Chloroform	28	NR	No potentially unacceptable risk was found in surface water (did not pass through the surface water SLERA).	28	RM	Max HQ <100 (21). 100 should be the threshold because a factor of at least 10 should be applied to account for the evidence that benthic receptors are not directly exposed to undiluted TZW due to their feeding habits (refer to BERA Section 6.3.3); an additional factor of 10 should be applied to account for the control of COPC sources because EPA guidance states that remedies should be evaluated under the assumption that sources of COPCs to the groundwater plume have been controlled.
1,1-Dichloroethene/1,1-Dichloroethylene (1,1-DCE)				25	NR	Max HQ <100 (exceeded in only 2 TZW samples, max HQ = 1.6). 100 should be the threshold because atfactor of at least 10 should be applied to account for the evidence that benthic receptors are not directly exposed to undiluted TZW due to their feeding habits (refer to BERA Section 6.3.3); an additional factor of 10 should be applied to account for the control of COPC sources because EPA guidance states that remedies should be evaluated under the assumption that sources of COPCs to the groundwater plume have been controlled.

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 7 (Eco Surfacewater)			RAO 8 (Eco Groundwater)		
	Surface Water (ug/L)			Pore Water (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
cis-1,2-Dichloroethene/cis-1,2-Dichloroethylene (c-1,2-DCE)				590	ND	
trans-1,2-Dichloroethene/trans-1,2-Dichloroethylene (t-1,2-DCE)				NA	NE	Not a TZW COPC.
Ethylbenzene	7.3	NR	Only one of 23 near bottom surface water samples exceeded the TRV with max HQ = 1.6.	7.3	RM	Max HQ <100 (57). 100 should be the threshold because a factor of at least 10 should be applied to account for the evidence that benthic receptors are not directly exposed to undiluted TZW due to their feeding habits (refer to BERA Section 6.3.3); an additional factor of 10 should be applied to account for the control of COPC sources because EPA guidance states that remedies should be evaluated under the assumption that sources of COPCs to the groundwater plume have been controlled.
Tetrachloroethylene (PCE)	840	NR	No potentially unacceptable risk was found in surface water (did not pass through the surface water SLERA).	NA	NE	Not a TZW COPC.
Trichloroethylene (TCE)	47	RM	Only one of 23 near bottom surface water samples exceeded the TRV with max HQ = 4.3.	47	ND	
Toluene				9.8	RM	Max HQ <100 (18). 100 should be the threshold because a factor of at least 10 should be applied to account for the evidence that benthic receptors are not directly exposed to undiluted TZW due to their feeding habits (refer to BERA Section 6.3.3); an additional factor of 10 should be applied to account for the control of COPC sources because EPA guidance states that remedies should be evaluated under the assumption that sources of COPCs to the groundwater plume have been controlled.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

	RAO 7 (Eco Surfacewater) Surface Water (ug/L)			RAO 8 (Eco Groundwater) Pore Water (ug/L)		
EPA's Chemicals of Concern	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale	EPA's PRG - 4-11-14	LWG Category of Disagreement	Summary of Disagreement Rationale
1,1,1- Trichloroethane (TCA)				NA	NE	Not a TZW COPC.
Vinyl chloride	NA	NR	No potentially unacceptable risk was found in surface water (did not pass through the surface water SLERA).	NA	NE	Not a TZW COPC.
o-Xylene				13	RM	Max HQ <100 (12). 100 should be the threshold because a factor of at least 10 should be applied to account for the evidence that benthic receptors are not directly exposed to undiluted TZW due to their feeding habits (refer to BERA Section 6.3.3); and an additional factor of 10 should be applied to account for the control of COPC sources because EPA guidance states that remedies should be evaluated under the assumption that sources of COPCs to the groundwater plume have been controlled.
m- and p-Xylene				67	RM	Max HQ <100 (4). 100 should be the threshold because a factor of at least 10 should be applied to account for the evidence that benthic receptors are not directly exposed to undiluted TZW due to their feeding habits (refer to BERA Section 6.3.3); an additional factor of 10 should be applied to account for the control of COPC sources because EPA guidance states that remedies should be evaluated under the assumption that sources of COPCs to the groundwater plume have been controlled.
Total Xylene				13	NE	Not a TZW COPC.
Other						
PBDE						
Cyanide	5.2[10]	NR	No potentially unacceptable risk in surface water.	5.2	ND	
Perchlorate				9300	RM	Max HQ <100 (19). 100 should be the threshold because a factor of at least 10 should be applied to account for the evidence that benthic receptors are not directly exposed to undiluted TZW due to their feeding habits (refer to BERA Section 6.3.3); an additional factor of 10 should be applied to account for the control of COPC sources because EPA guidance states that remedies should be evaluated under the assumption that sources of COPCs to the groundwater plume have been controlled.

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 2
Summary of Lower Willamette Group Outstanding Disagreements with EPA's April 11, 2014 Preliminary Remediation Goals

Notes:

Shading indicates the COC/PRG is not needed because it is inconsistent with the primary concepts presented in the Attachment 1 Issue Statement.
NE = Risk for this scenario was not evaluated in the risk assessment.
NR = No potentially unacceptable risk was found in the risk assessment for this contaminant via this pathway.
RM - Applying reasonably conservative risk management principals, this contaminant should not be identified as a COC or require a PRG for this pathway.

Other Noted LWG Disagreements (and Agreements) with PRG Values Shown:

C = LWG agrees that a COC/PRG is potentially appropriate, but does not agree the PRG is calculated or assigned correctly. These additional issues were noted to EPA in LWG's April 23, 2014 PRG disagreements summary.

T = LWG agrees that the contaminant was found to pose unacceptable human health risk via fish consumption, but does not agree tissue levels should be performance goals for the remedy or should be defined as "PRGs" for the revised FS.

F = Per LWG's April 23, 2014 PRG disagreements list, the LWG was only recently provided sufficient information to verify Food Web Model outputs used to calculate this value and has not yet verified the value was calculated appropriately.

BT = For benthic toxicity related PRGs, instead of using the PEC, EPA should follow LWG recommendations in our April 23, 2014, list of disagreements (also see the Attachment 3 Issue Statement).

ND = No disagreement

a - mg/kg-OC
b - 2,3,7,8 PeCDF

EPA Footnotes:

1 This value is for Arsenic III.
2 This value is for Chromium VI.
Freshwater aquatic life values for pentachlorophenol are expressed as a function of pH, and are calculated as follows: CMC=(exp(1.005(pH)-4.869); CCC=exp(1.005(pH)-5.134).
3 Value based on pH=7.8.
4 This value is for the sum of 2-4' and 4-4' isomers of either DDE or DDT; 0.000031 µg/L is the value for the sum of 2-4' and 4-4' DDD isomer.
5 The arsenic criteria are expressed as total inorganic arsenic. The "water + organism" criterion is based on a risk level of 1×10^{-4}
6 Anthracene = 0.73 µg/L; Benzo(a)anthracene = 0.027 µg/L; Benzo(a)pyrene = 0.014 µg/L; 2-methylnaphthalene = 2.1 µg/L; Naphthalene = 12 µg/L.
7 This value is for DDT.
8 This value is for the dissolved fraction.
9 This is a hardness dependent metal. All values were calculated based on 25 mg/l of CaCO3
10 Expressed as free cyanide.
11 Value expressed as total cyanide (CN)/L.

NA Value not available.

Acronyms:

µg/kg = micrograms per kilogram
AWQC = Ambient Water Quality Criteria
BEHP = bis-2-ethylhexylphthalate
BERA = Baseline Ecological Risk Assessment
BHHRA = Baseline Human Health Risk Assessment
CBRA = comprehensive benthic risk approach
COC = contaminant of concern
COPC = contaminant of potential concern
cPAH = carcinogenic polycyclic aromatic hydrocarbon
dw = dry weight
EPA = U.S. Environmental Protection Agency
FPM = floating point model
HQ = hazard quotient
HPAH = high molecular weight polycyclic aromatic hydrocarbon
LOAEL = lowest observed apparent effects level
LOE = line of evidence
LRM = logistic regression model
LWG = Lower Willamette Group
MCPP = meta-Chlorophenylpiperazine
mg/L = milligrams per liter
PAH = polycyclic aromatic hydrocarbon
PBDE = polybrominated diphenyl ethers
PCB = polychlorinated biphenyls
PEC = probable effects concentration
PRG = Preliminary Remediation Goal
RI/FS = Remedial Investigation/Feasibility Study
RM = river mile
RPD = Redox Potential Discontinuity
SLERA = screening level ecological risk
SVOC = semi-volatile organic compound
SQG = Sediment Quality Guideline
SQV = Sediment Quality Value
TBT = tributyltin
TEQ = toxicity equivalent
TPH = total petroleum hydrocarbons
TRV = toxicity reference value
TZW = transition zone water
VOC = volatile organic compound
ww = wet weight

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

ATTACHMENT 2 – SEDIMENT EQUILIBRIUM ISSUE STATEMENT FOR SECTION 2 OF THE REVISED FEASIBILITY STUDY

As part of the Portland Harbor Superfund Site Feasibility Study (FS) revision process, the U.S. Environmental Protection Agency (EPA) and the Lower Willamette Group (LWG) have discussed the difference between "background" (i.e., upstream bedded sediment concentrations as presented in the Remedial Investigation [RI]) and the concept of "equilibrium" conditions for the Study Area (i.e., potential future bedded sediment concentrations within Portland Harbor). The LWG has discussed its views with EPA on how best to establish Preliminary Remedial Goals (PRGs) in relation to upstream bedded sediment conditions. These views will be presented under separate cover to EPA and are not repeated here.

This document focuses on proposing the establishment and use of equilibrium concentrations. The revised FS should fully consider equilibrium conditions when evaluating the following:

- PRG selections (Section 2 of the revised FS)
- Surface Weighted Area Concentration (SWAC) calculations (Sections 3 and 4)
- PRG application over various spatial scales (Sections 3 and 4 of the revised FS)
- The detailed evaluations of alternatives (Section 4).

Further, different combinations of lines of evidence regarding equilibrium concentrations will likely be needed for the different types of evaluations in the revised FS.

EQUILIBRIUM CONCEPT

Achievable remedy objectives must include examining what is deposited within the Study Area, both physically and chemically (i.e., potential future bedded sediment equilibrium). The RI and FS conceptual site model (CSM) indicates a large input of sediment into the Study Area from the upstream watershed and river. This sediment flux is orders of magnitude larger than within the Study Area sediment fluxes (draft FS Appendix La). The CSM also indicates a considerable amount of the upstream sediment deposits within the Study Area. This has been well established through multiple lines of evidence including time series multi-beam bathymetry, sediment trap data (natural and deployed), radioisotope coring data, grain size information, sediment profile imaging, and surface to subsurface concentration ratios, as well as evidence provided by maintenance dredge requirements and records at many locations throughout the Study Area (all detailed in Section 6.2.2 of the draft FS). The CSM also indicates that although some areas of the river are not fully depositional (i.e., in dynamic equilibrium or episodically erosional), there is sufficient long-term deposition in areas across the Study Area that this sediment accumulation is decreasing the bedded sediment SWACs over a variety of spatial scales and areas.

It is further understood that the upstream source of depositing sediments has lower baseline chemical concentrations than the within Study Area bedded sediments. This information leads to the conclusion that most Study Area SWACs are trending downward over time towards lower concentrations that will eventually reach an equilibrium as the result of sediment titration which is controlled by the concentrations of chemicals in the incoming sediments from upstream. The Study Area cannot achieve concentrations lower than that of the equilibrium level. This is true whether the Study Area is left alone as is the case of No Action or aggressively actively remediated because remediated areas (caps and dredge areas) will be impacted by depositing sediment regardless of short term effects associated with remediation activities. Equilibrium establishes the limiting condition associated with the sediments within this Site.

EQUILIBRIUM APPROACH

The question becomes, what is the equilibrium concentration likely to be and how much uncertainty is there around that expected concentration? The LWG is ready to propose specific approaches for calculating equilibrium concentrations and engaging immediately with EPA to develop a path forward for the revised FS. The approach would specifically utilize a combination of the following in addition to other site-specific information:

- Existing RI/FS Empirical Data
    - Deposited and bedded sediment data
    - Sediment Trap Data
    - Upstream Bedded Sediment Data
    - 2002, 2007, and 2012 Smallmouth Bass Fish Tissue Data
- Model Projections—Draft FS Fate and Transport Model
    - Coupling of QEA-FATE and Dynamic Food Web Model (CSM)

Existing RI/FS empirical data available to support equilibrium calculations are generally summarized in Table 1, using two remedial action level contaminants (Total polychlorinated biphenyls and Total DDx) as examples.

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 1. Summary of Available Data Related to Sediment Contaminant Concentrations Entering the Study Area.

Analyte	Line of Evidence	Valid N	Concentration (micrograms per kilogram)			
			Mean	Median	Minimum	Maximum
Total DDx	Deposited Sediment in Upper Portions of Study Area[a]	34	4.35	4.40	0.88	11.0
	Deposited Sediment between RM 15.3 and 11.8[b]	155	6.63	3.36	0.13	73.3
	Deposited Sediment above RM 15.3[c]	83	2.30	1.90	0.13	14.6
	Upstream Sediment Traps[d]	10	5.01	4.67	2.50	7.35
	Incoming Suspended Sediment[e]	17	13.3	8.30	1.71	65.3
Total PCB Aroclors	Deposited Sediment in Upstream Portions of Study Area[a]	34	13.1	7.50	2.50	31.0
	Deposited Sediment between RM 15.3 and 11.8[b]	157	76.1	20.00	0.73	4216
	Deposited Sediment above RM 15.3[c]	83	11.5	7.10	1.00	53.0
	Upstream Sediment Traps[d]	10	42.8	6.90	3.10	310
	Incoming Suspended Sediment[e,f]	7	9.01	9.23	1.56	24.6

Notes:

[a] Stations G486, G483, G734, G745-1, G745-2, G466, RC483-2 situated on a natural shoaling area away from any known sources of DDx or PCBs.

[b] Not including Zidell data.

[c] Including both Cat 1 QA2 and Cat 1 QA1 data.

[d] Borrow pit "natural" sediment trap stations RC01-1 and RC01-2 and deployed sediment traps ST008 (RM 11.5W), ST010 (RM 15.6W), and ST090 (RM 15.7). Data from the sediment trap at RM 11E (ST007) not included.

[e] Particulate surface water samples from all RM 16 and RM 11 sampling events. PCB data from RM 11 were excluded.

[f] Suspended Sediment data is Total PCB Congeners, no Aroclor data were available.

PCB = polychlorinated biphenyl

RM = river mile

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

ATTACHMENT 3 – ADDITIONAL OUTSTANDING ISSUE STATEMENTS FOR SECTION 2 OF THE REVISED FEASIBILITY STUDY

EXECUTIVE SUMMARY

This attachment contains additional issue statements that the Lower Willamette Group (LWG) requests the U.S. Environmental Protection Agency (EPA) adopt while drafting Section 2 of the revised Feasibility Study (FS). These issues are in addition to the contaminants of concern/preliminary remediation goals (COCs/PRGs) and equilibrium issue statements provided previously in Attachments 1 and 2. In particular, this Attachment 3 describes why the LWG believes EPA should:

1. If necessary, develop background values for surface water using available upstream surface water data and develop background values for transition zone water (TZW) using the considerable body of research literature from other sites regarding the concentrations of contaminants in non-Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or non-contaminated sites (see Section 1).
2. Compare the Dioxin/Furan (D/F) Toxic Equivalents Quotient (TEQ) sediment PRGs to background and, as required, adjust the PRGs to background (see Section 2).
3. Evaluate remedial alternatives using risk-based PRGs applying the same spatial scales as the risk calculations in the risk assessments. To the extent this is an issue that will be addressed in FS Chapter 4, the LWG urges EPA to begin discussions on this issue now (see Section 3).
4. Include the site use factor in the calculation of the in-water sediment PRGs for fisher scenarios, consistent with the Baseline Human Health Risk Assessment (BHHRA; see Section 4).
5. Use the LWG's approach to derive the PRGs for 2,3,4,7,8-PeCDF in sediment, which was previously approved by EPA, and use the location-specific (i.e., river mile [RM] or zone) contribution of 2,3,4,7,8-PeCDF to the TEQ to derive the TEQ sediment PRG (see Section 5).
6. Express the BaPEq PRG based on human health clam consumption on an organic carbon normalized basis, do not use the clam consumption PRG as a surrogate for vertebrate fish consumption because it is not applicable to that scenario, and discontinue efforts to further explore a "floor concentration" related to vertebrate fish consumption because the data clearly show no relationship between sediment and vertebrate fish tissue polycyclic aromatic hydrocarbon (PAH) concentrations (see Section 6).
7. Instead of using individual chemical sediment benthic PRGs for Remedial Action Objective (RAO) 5, develop a PRG that is based on the Comprehensive Benthic Risk Approach (CBRA). Specifically, the LWG recommends that the PRG should be described as meeting two of the three predicted benthic toxicity thresholds that are used in the CBRA:
    a. LRM L3 Pmax less than 0.59
    b. FPM L3 MQ less than 0.7

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

   c. PEC MQ less than 0.7 (see Section 7)

8. Discuss with the LWG now the issues of technology criteria, selection scoring, technology assignment, and in particular, the evaluation of monitored natural recovery (MNR), which has not been discussed at all in any of the 2014 FS technical meetings (see Section 8).
9. Calculate sediment background values based on statistical assessments of upstream bedded sediment data that are based on technically sound methods consistent with standard accepted statistical practices and EPA's guidance.

1 - BACKGROUND VALUES FOR SURFACE WATER AND TRANSITION ZONE WATER

Based upon EPA direction, the LWG's March 2012 Draft FS Report was developed based on a list of COCs and PRGs that did not include surface water or TZW PRGs. EPA has recently provided the LWG with a list of PRGs that includes surface water and TZW.[1] The LWG disagrees that surface water or TZW PRGs are necessary or useful for remedy selection for reasons explained in the draft FS. Because the draft FS Report was not premised on the assumption that there would be PRGs for surface water and TZW, the LWG did not develop background values for those water media. If EPA proceeds with the addition of surface water and TZW PRGs, which the LWG believes it should not, PRGs should be developed only for contaminants that have been shown to have an unacceptable risk in either the BHHRA or the BERA and are due to contributions from the Site (i.e., not a background issue). For those, it would then be essential that background values be established.

As discussed in Attachment 1, EPA guidance states that if the baseline risk assessment indicates there is no unacceptable risk then no remedial action, COC, or PRG is needed (EPA 1991). If there are unacceptable risks in surface water and TZW, the primary reason to derive appropriate background values for surface water and TZW is so that cleanup levels are not set below background. EPA guidance on background and CERCLA states that, "for anthropogenic contaminant concentrations, the CERCLA program normally does not set cleanup levels below anthropogenic background concentrations" (EPA 2002). EPA guidance also provides that PRGs should be achievable by the remedy: "The project manager may discuss these other actions in the ROD [Record of Decision] and explain how the site remediation is expected to contribute to meeting area-wide goals outside the scope of the site, such as goals related to watershed concerns, but Remedial Action Objectives (RAOs) should reflect objectives that are achievable from the site cleanup" (EPA 2005).

EPA has stated during recent FS technical discussions that it has been comparing potential risk-based PRGs to the Remedial Investigation (RI) background estimates presented in Section 7 of the revised final RI, consistent with the guidance referenced above. However, LWG understands that EPA is only conducting these background comparisons for sediment PRGs, and not for surface water or TZW PRGs. Apparently the latter PRGs are either risk-based or are from water quality criteria or guideline values. In many cases, it is likely that the surface water and TZW

[1] See Attachment 1 for further detail.

PRGs will not be technically practicable to achieve due to ongoing upstream contributions or groundwater sources that will not be addressed by the anticipated sediment remedy.

Because the draft FS Report was not premised on the assumption that there would be surface water and TZW PRGs, data necessary to calculate those background levels were not fully developed. USEPA indicated during the FS technical discussions that there were insufficient site data in surface water and TZW to develop background levels in these media. The LWG disagrees with EPA's opinion. The LWG believes there are sufficient site data to establish background for surface water. The evaluation of upstream conditions (background levels) in most media was a specific objective for the RI. There are sufficient data in the RI to develop background levels for surface water and sufficient non-site-specific data of various kinds to support an adequate comparison to background-type conditions for TZW. The LWG believes surface water and TZW background levels should be established for the revised FS.

Surface Water

For surface water, chemistry data at the upper Study Area boundary and farther upstream were collected for and are presented in the RI. Surface water chemistry data were collected at the upper Study Area boundary (RM 11) and upstream of Ross Island (RM 16) from 2004 through 2007. These high-quality data were collected over a range of flow conditions and include a complete suite of analytes with low detection limits. In 2009, the LWG and EPA agreed to use this data set for the development of surface water background estimates. In both the Draft (2009) and Draft Final RI (2011) reports, these data were used to develop surface water background estimates for COCs that may require surface water PRGs by EPA.[2] The surface water background estimates in the Draft RI were reviewed by EPA without objection or major comment at that time. However, upon review of the draft final RI in 2013, EPA directed the removal of these surface water background estimates. During the 2013 Final RI Section 7 technical discussions, the LWG stated that there are adequate, and theretofore acceptable, data to develop surface water background statistics. The LWG continues to disagree with EPA, and feels there is adequate surface water data to develop background estimates.

EPA should further discuss with the LWG the available upstream surface water data to determine technically reasonable approaches to calculating surface water background levels. Proceeding in the absence of surface water background values will result in performance standards that are based on incomplete and/or flawed assumptions and a remedy decision that is not technically practicable or achievable.

Transition Zone Water

For TZW, upstream chemistry datasets from uncontaminated areas do not exist in the RI database. However, there is a considerable body of research literature from other across the region regarding the concentrations of constituents in non-CERCLA or non-contaminated sites. These data could be used to provide a more informal context for TZW PRG decisions.[3] A simple literature research protocol could be developed for identifying appropriate potential

[2] Per agreement with EPA, elevated data for certain indicator chemicals with known sources at RM 11 east were excluded from the background surface water data set.

[3] .

literature data, organizing those data, and selecting reasonably conservative constituent concentrations for contextual use in the revised FS.

The LWG is particularly concerned about the proposed TZW PRGs for naturally occurring constituents (such as metals). An example of the potential problem is EPA's proposed TZW PRG for manganese, which is likely lower than naturally occurring levels in portions of the Study Area. The LWG conducted a brief review of manganese freshwater sediment porewater levels at non-contaminated sites (Table 1).

Table 1. Concentrations of Manganese in Freshwater Sediment Porewater.

Location	Sample Count	Min	Max	Median	Units	Source
White Canyon, Lake Powell, Utah	207	--	--	385	µg/L	Wildman et al. 2010
Farley Canyon, Lake Powell, Utah	197	--	--	456	µg/L	Wildman et al. 2010
Payne Lake drainage basin, Talladega National Forest, Alabama - *Juncus effusus* dominated	8	--	--	6,750	µg/L	Donahoe and Lui 1998
Payne Lake drainage basin, Talladega National Forest, Alabama - *Nymphaea odorata* dominated	8	--	--	1,950	µg/L	Donahoe and Lui 1998
Silver Lake, Washington	--	165	549	--	µg/L	Moore et al. 1993
Lower St. Lawrence Estuary, Quebec (top 20 cm)	22	0.3	11	--	µg/L	Madison et al. 2013
Rostherne Mere, United Kingdom (top 10 cm)	5	20	23	20	µg/L	Davison and Woof 1984
19 Calcareous Lakes in Midwestern US (note this is anoxic benthic boundary layer water, not actual porewater)	24	135	3300	478	µg/L	Stauffer 1987

Note:
µg/L = micrograms per liter

EPA's proposed manganese TZW PRGs for RAO 4 and RAO 8 are 320 micrograms per liter (µg/L) and 120 µg/L, respectively. The LWG does not agree that these are technically valid PRGs for reasons that are discussed in Attachment 1. Regardless, the above table presents minimum, maximum, and median values at uncontaminated sites that are often in excess of the EPA-proposed PRGs. .

The LWG recognizes that the above example does not represent an exhaustive literature search and that site-specific differences likely exist between some of the sites presented and Portland Harbor, which could be explored further in an actual identification of TZW background levels. In particular, contributions/influences associated with local geology should be considered in the literature evaluations. For example, volcanic lithologies have higher natural manganese concentrations and would contribute more manganese to sediment and dissolved fractions. Hardness/alkalinity, pH, dissolved oxygen, and redox potential also all have a strong effect on manganese solubility, and therefore, to the extent provided, should be noted in the literature sources to allow appropriate comparisons.

However, even without a more comprehensive literature survey, this cursory review of available information on uncontaminated manganese concentrations in freshwater sediments suggests that EPA's manganese TZW PRGs are unachievable due to background. It is likely that similar issues exist with other TZW PRGs proposed by EPA.

2 - DIOXIN/FURAN TOXICITY EQUIVALENT SEDIMENT BACKGROUND VALUES

EPA has indicated during revised FS technical discussions that it has been comparing potential risk-based sediment PRGs to the RI background sediment estimates that are being prepared for the final RI. The LWG agrees that EPA should not select sediment PRGs below anthropogenic background, consistent with guidance (EPA 2002). It appears that EPA has not yet made this comparison to the D/F TEQ sediment PRGs presented in EPA's proposed PRGs table (April 11, 2014 version). Consistent with EPA's stated approach that PRGs below background should not be selected, D/F background values should be compared to any proposed risk-based D/F TEQ PRGs.

EPA's proposed PRG table contains D/F TEQ sediment PRGs as follows:

- RAO 1 (human health sediment direct contact) – 0.01 microgram per kilogram (µg/kg)
- RAO 2 (human health fish consumption) – 0.00003 µg/kg
- RAO 6 (ecological bioaccumulation) – 0.054 µg/kg

In the issue statement in Section 4 below for "Human Health Sediment Direct Contact Site Use Factor," the LWG recommends that the RAO 1 PRG be calculated using methods consistent with the BHHRA. In the issue statement in Section 5 below for "Dioxin/Furan Sediment PRGs for RAOs 2 and 6," the LWG recommends that these last two PRGs be calculated using an alternative method described there. Further, the LWG recommends that EPA use alternate methods to calculate reasonably achievable background levels based on readily available site equilibrium data (as discussed in Attachment 2). Therefore, comparisons between EPA's proposed sediment D/F PRGs and EPA's proposed background statistics are made in the remainder of this section for illustrative purposes only. However, the LWG believes that similar comparisons between reasonably achievable background levels (per Attachment 2) and the LWG-recommended PRGs (in Section 5 below) should be made to select the final D/F TEQ PRGs for these RAOs.

Appendix H of Section 7 of the revised final RI will include D/F TEQ (mammals 2006) background values as part of the "additional indicator contaminants" discussion in Section 7. Integral Consulting, Inc., has recalculated Appendix H values on behalf of the LWG consistent with EPA-directed methods for the calculation of background values. These recalculated values are shown in Table 2.

Table 2. D/F TEQ Dry Weight and Organic Carbon-Equivalent Background Statistics Using EPA-directed Calculation Methods (to be included in Final RI Appendix H).

Analyte	95% Upper Prediction Limit, µg/kg		95% Upper Confidence Limit, µg/kg	
	Outliers Included	Outliers Excluded	Outliers Included	Outliers Excluded
D/F TEQ (mammals 2006) Dry Weight	0.0034	0.00266	0.00279	0.00127
D/F TEQ (mammals 2006) OC-equivalent	0.00549	0.00427	0.00450	0.00205

Note:
µg/L = micrograms per liter

Examining EPA's proposed PRGs table, a key example of EPA's PRG selection process is the polychlorinated biphenyl (PCB) PRG value of 6 µg/kg for total PCBs for RAO 2. This value appears to be based on the UCL for PCBs (Aroclors) with all outliers excluded, based on EPA's November 2013 PRG presentation and subsequent FS discussions. The analogous value from Table 2 for D/F TEQ is 0.00127 µg/kg (UCL with outliers removed).

The EPA D/F TEQ PRG for RAO 2 of 0.00003 µg/kg is lower than EPA's selected background UCL value of 0.00127 µg/kg by several orders of magnitude. Therefore, the EPA-proposed RAO 2 D/F TEQ PRG should not be used by EPA. Further, we recommend that EPA make a similar comparison between the LWG-recommended D/F TEQ PRGs for RAO 2 in Section 5 below and the equilibrium levels discussed in Attachment 2, and only select PRG values that are above reasonably achievable equilibrium levels.

Also, it appears that EPA's proposed RAO 6 D/F TEQ PRG of 0.054 µg/kg is actually based on a 2,3,4,7,8-PCDF concentration. If EPA retains this value after considering LWG recommendations in Section 5 below, it should be labeled as a PCDF value. In addition, EPA should compare this value (if retained) to available total PCDD/F equilibrium values to complete the PRG selection process.

Finally, the RAO 1 D/F TEQ PRG of 0.01 µg/kg is above both the EPA- and LWG-recommended D/F TEQ background values. The LWG further explains in the discussion of human health direct contact PRGs in Section 4 below that EPA's PRGs should be elevated by a factor of 4 (for reasons stated in that discussion). Using either EPA or LWG methods for this risk-based PRG and background value selection, a background value should not be selected for this PRG.

3 - APPROPRIATE SPATIAL SCALES FOR PRG COMPARISONS

The LWG believes the spatial scales over which the PRGs are applied are a key element of the respective exposure scenarios being represented by the PRG. The spatial scales are as fundamental to establishing PRGs as the numeric values themselves. EPA indicated that it may apply the PRGs on several different spatial scales (April 18, 2014 email to the LWG). The LWG has concerns with EPA's intended spatial scale considerations because these PRG spatial applications are not consistent with the risk assessment exposure areas and calculations in the approved risk assessments. The LWG's technical view is that the risk-based PRGs proposed by EPA should be consistent with the spatial scales of the risk calculations upon which they are

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

based (i.e., the risk assessments). The LWG further does not agree with EPA that the spatial scale discussion can wait until Section 4. EPA is contemplating using PRGs to influence the development of alternatives (e.g., technology selection and dredge depths for Section 3). Therefore, it is imperative the LWG and EPA resolve any issues on spatial scale now.

The risk-based PRGs that EPA has proposed in order to be valid must be explicitly based on the risk assessments and on specific risk scenarios used to characterize risk. EPA developed these risk scenarios and directed the LWG to use them in the risk assessments. Consistent with CERCLA guidance and previous agreements with EPA for this site, the LWG believes that, as much as practicable, evaluations of remedial alternatives using risk-based PRGs should be consistent with the spatial scales of the risk calculations in the risk assessments. It is beyond the scope of this document to discuss all the reasons why this is technically correct and consistent with guidance. However, in summary, applying PRGs on risk-based spatial scales helps ensure that 1) risk reductions expected from remedial alternatives are accurately evaluated in the FS; and 2) the alternative selection is a risk-based decision consistent with guidance (EPA 1991 and EPA 2005).

The LWG's understanding of EPA's considerations regarding the different potential spatial scale evaluations not consistent with the risk assessments in the April 18, 2014 email are:

- A surrogate or representative spatial scale across all PRGs within each RAO. EPA desires one spatial scale that will apply to each RAO to simplify revised FS alternatives evaluations. EPA has indicated that this is a surrogate because the most appropriate spatial scales across all PRGs within each RAO may vary.
- A Sediment Decision Unit (SDU) spatial scale evaluation to confirm that the Sediment Management Areas (SMAs) based on the bounding Remedial Action Levels adequately address all COCs. We understand that EPA is cognizant that the SDU spatial scales may vary considerably from the most appropriate spatial scale for each individual PRG.

One concern is that many of the surrogate spatial scales that EPA has selected for each RAO are not equivalent to any exposure area used in the risk assessments. For example, nowhere in the risk assessments are exposure areas divided using eastern shore, western shore, and navigation channel. The spatial scale for an RAO should be consistent with the exposure area for that RAO from the risk assessment.

A second concern is that the risk assessments already present reasonable maximum exposures (RMEs), so modifying the spatial scales in this manner results in overly conservative assumptions of risk. For instance, the RAO 2 fish consumption PRGs are calculated for the RME of a subsistence fisher and subsistence fisher infant. Based on that RME exposure scenario, the spatial scale under RAO 2 would be site-wide. If EPA desires the evaluation of smaller exposure areas for this RAO, then the exposure scenario should be adjusted so that it appropriately reflects the smaller exposure scale. For example, a site use factor could be applied to the subsistence fisher-based PRGs to appropriately adjust the PRG consistent with the smaller spatial scale being evaluated.

A third concern is that for the surrogate and SDU evaluations, it appears that EPA is applying PRGs globally throughout the Site, including in areas where a contaminant and receptor/scenario

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

pair were not found to pose risk in the risk assessments or where no complete exposure pathway is present. If this is the intent, the LWG disagrees that PRGs should be applied to areas where no relevant potentially unacceptable risks were found. Again, consistent with EPA guidance, the approved baseline risk assessments constitute EPA's conclusions about the areal extent of potentially unacceptable risk at the Site. Applying PRGs in areas with no demonstrated potentially unacceptable risk is inconsistent with guidance and does not provide a foundation for remedial action under CERCLA §§ 104(a)(1) and 106 (EPA 1991).

Finally, EPA's April 18, 2014 email included a statement that, "Other spatial scales may also be looked at in the FS." For example, EPA appears to be considering retaining the spatial scales used in the EPA-approved BHHRA and Baseline Ecological Risk Assessment (BERA) for some evaluations. EPA indicated a residual risk assessment for the revised FS would be one approach for looking at spatial scales consistent with the risk assessments, and the LWG plans to submit a technical memorandum outlining such an approach.

4 - HUMAN HEALTH SEDIMENT DIRECT CONTACT SITE USE FACTOR REMEDIAL ACTION OBJECTIVE 1

In the BHHRA, risks from direct contact (i.e., incidental ingestion and dermal contact) with in-water sediment were evaluated for fishers, in-water workers, and divers. For the fisher scenarios, the exposure calculations included a factor of 25 percent for the sediment contact frequency (i.e., site use factor). Per the BHHRA, the factor "Represents the percent of time spent fishing in a single area within the study area. Recommended by EPA Region 10." The intent of the factor in the BHHRA was to offset some of the conservative exposure assumptions included in the fisher scenarios, especially given that risks to fishers were evaluated on a half-RM basis in the BHHRA.

In calculating the in-water sediment PRGs, EPA arbitrarily decided to eliminate the site use factor. The justification that EPA provided in recent FS discussions for doing so was that the in-water sediment PRGs would not be protective of the fisher scenarios if the site use factor were included. The LWG disagrees for the following reasons:

- Eliminating the site use factor is inconsistent with the EPA-approved BHHRA. If EPA intends to apply the in-water sediment PRGs on a rolling half-RM average per side of river, which is generally consistent with the fisher evaluation in the BHHRA (the BHHRA evaluation was for a fixed half-RM segment). As acknowledged by EPA Region 10 in developing the exposure assumptions for the BHHRA, it is unlikely that fishing would occur exclusively within a single half-mile area under the exposure assumptions used in the BHHRA.
- Other exposure assumptions included in the scenario are already conservative and protective of the fisher, regardless of whether the site use factor is included. The tribal fisher scenario, which is the basis of the PRG, assumes that an individual fishes within Portland Harbor (or an individual half-RM segment if the site use factor is eliminated) for 5 days a week, every week of the year (260 days), and this occurs for 70 years. In addition, whenever this individual fishes, he covers his hands and forearms with sediment and ingests 50 milligrams of sediment. Eliminating the site use factor from these already

extremely conservative scenarios would result in them being maximum exposures, as opposed to reasonable maximum exposures.

The LWG requests that EPA include the site use factor in the calculation of the in-water sediment PRGs for fisher scenarios, consistent with the BHHRA. The BHHRA received extremely careful scrutiny, including detailed formal dispute resolution briefing, before EPA's final approval. "The primary purpose of the baseline risk assessment is to provide risk managers with an understanding of the actual and potential risks to human health and the environment posed by the site and any uncertainties associated with the assessment" (EPA 1991). We do not understand why EPA no longer believes that the BHHRA is an adequate tool for EPA to evaluate whether potential remedial alternatives are adequately protective. If anything, the LWG believes the BHHRA is extremely conservative and tends to overestimate the actual Site risks.

5 - DIOXIN/FURAN SEDIMENT PRELIMINARY REMEDIATION GOALS FOR REMEDIAL ACTION OBJECTIVES 2 AND 6

In the BHHRA, risks from D/F congeners were evaluated on the basis of the 2,3,7,8-TCDD TEQ. The TEQ represents the cumulative toxicity of the mixture of individual congeners. The TEQ is calculated by multiplying the concentrations of the individual congeners in the exposure media with their respective 2,3,7,8-TCDD toxicity equivalence factors (TEFs) and then summing the weighted concentrations.

EPA's sediment PRG for the TEQ was calculated using the food web model (FWM) and 2,3,4,7,8-PeCDF as the surrogate for the TEQ. The LWG disagrees with the approach that EPA used to relate the TEQ to 2,3,4,7,8-PeCDF in both tissue and sediment.

For purposes of developing PRGs for fish consumption, the exposure medium is the fish tissue. Concentrations in the fish tissue, then, are related to sediment concentrations through the use of the FWM that was developed for the Portland Harbor Superfund Site. Because the TEQ combines concentrations and toxicity, it cannot be modeled through the FWM. Only individual D/F congeners, which are based solely on concentration, can be modeled. Therefore, the concentration of an individual congener (or multiple congeners) must be modeled and then related back to the TEQ. Based on analysis of tissue concentrations and per prior agreements with EPA, 2,3,4,7,8-PeCDF was selected as the congener that would be modeled and related back to the TEQ for purposes of the FWM.

The LWG disagrees with EPA's application of the TEF to derive the 2,3,4,7,8-PeCDF tissue concentration. This approach is not technically sound because the TEF only reflects how the toxicity of 2,3,4,7,8-PeCDF relates to the toxicity of 2,3,7,8-TCDD. The approach used by EPA does not consider how 2,3,4,7,8-PeCDF contributes to the overall TEQ, which is what must be considered in using an individual congener as a surrogate for the TEQ. Similarly, after modeling the sediment PRG for 2,3,4,7,8-PeCDF, EPA applied the TEF to derive the TEQ sediment PRG. Again, this approach simply accounts for the toxicity of a single D/F congener, 2,3,4,7,8-PeCDF, relative to 2,3,7,8-TCDD; it does not consider how 2,3,4,7,8-PeCDF contributes to the TEQ in sediment, which is a factor of both the TEF and concentration as well as the concentrations and TEFs of the other D/F congeners that contribute to the TEQ.

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

The LWG requests that EPA use the LWG's approach to derive the PRG for 2,3,4,7,8-PeCDF in sediment, which was previously approved by EPA. Under this approach, the regression relationship between 2,3,4,7,8-PeCDF and the TEQ is used to derive the 2,3,4,7,8-PeCDF tissue concentration from the target tissue concentration for the TEQ. The strong correlation between 2,3,4,7,8-PeCDF and the TEQ is what justifies the use of 2,3,4,7,8-PeCDF as the surrogate for the FWM. This relationship should also be used to derive the 2,3,4,7,8-PeCDF tissue concentration for any EPA-proposed tissue levels under RAO 2.

Previously, the LWG used the sediment PRG for 2,3,4,7,8-PeCDF as the sediment PRG that would be protective of the TEQ. However, based on further analysis of sediment congener data (Figures 1a through 1d), the contribution of 2,3,4,7,8-PeCDF to the TEQ varies spatially within the Site. Therefore, the LWG proposes using the location-specific (i.e., RM or zone) contribution of 2,3,4,7,8-PeCDF to the TEQ to derive the sediment PRG for the TEQ. With this approach, the sediment PRG for the TEQ in a given RM/zone is calculated by dividing the 2,3,4,7,8-PCDF sediment PRG derived by the FWM by the fractional contribution to the TEQ at the RM/zone in question. As a result, the TEQ sediment PRG varies by RM/zone consistent with the contribution of 2,3,4,7,8-PeCDF to the TEQ. This approach accounts for the spatial variability in the concentrations of the individual D/F congeners while still applying the surrogate approach for purposes of modeling. The range of TEQ sediment PRGs shown as cumulative distributions is presented in Figure 2a and Figure 2b for RAO 2 and RAO 6, respectively.

6 - BaPEq SEDIMENT PRELIMINARY REMEDIATION GOAL FOR REMEDIAL ACTION OBJECTIVE 2

On April 11, 2014, EPA provided additional information to LWG on EPA's proposed BaPEq PRG of 4,000 µg/kg for RAO 2 (human health fish consumption). In summary, that information indicates that EPA calculated the PRG using a Biota Sediment Accumulation Regression (BSAR) based on field clam data for BaP. The BSAR was expressed on a lipid-normalized (biota) to organic carbon-normalized (sediment) basis. EPA converted the sediment PRGs to dry weight basis by factoring in an overall field clam lipid content of 2.2 percent and a site-wide average organic carbon content of 1.7 percent.

The use of a single estimate of site-wide organic carbon content to determine a site-wide dry weight-based PRG results in either over- or under-prediction of toxicity at a particular location given the range of organic carbon contents present at the Site. This is important because EPA is proposing to apply the RAO 2 PRGs on a rolling RM basis by east shoreline, west shoreline, and navigation channel. There will be significant variations in organic carbon contents across the Site within this relatively small spatial scale, particularly given that the navigation channel often contains much coarser sediments with lower organic carbon.

To correct for this variation, any BaPEq PRG should be expressed on an organic carbon-normalized basis. Organic carbon-normalized units are widely used in sediment studies and PRGs (e.g., Harbor Island, Pacific Sound Resources, and Eagle Harbor Superfund sites as well as the Puget Sound Naval Shipyard site) and are not any more difficult to use than dry weight PRGs. In fact, EPA previously directed the LWG to use an organic carbon-normalized focused PRG for BaPEq for the draft FS, which was also based on human consumption of clams (see draft FS Table 3.5-2). This organic carbon-normalized PRG was integrated into the draft FS along with other dry weight PRGs with no particular difficulty.

EPA further indicated that the clam PRG would be used as a “surrogate” for fish consumption risks. The clam consumption and fish consumption risk estimates are derived from two entirely different scenarios evaluated in the BHHRA using different exposure areas and different exposure assumptions. The clam consumption scenario assumed the clams were located in relatively shallow waters along the shoreline where clam consumption and potential exposure could occur. Fish consumption was assumed to occur throughout the Site. Using clam consumption as a surrogate for fish consumption results in the application of this PRG to areas where the clam consumption exposures could not occur (e.g., in deeper water) and where no risks from such consumption were found in the BHHRA. As discussed in Attachment 1 (COC and PRG Issue Statement), PRGs should be based upon potentially unacceptable risks identified through the baseline risk assessments. Because EPA’s proposed BaPEq PRG for fish consumption is being applied to areas that were not included in the BHHRA, that PRG has no relationship to actual risks to people and cannot be used to determine the protectiveness or effectiveness of an alternative in the FS.

The LWG has previously pointed out to EPA that there is no relationship between concentrations of BaP in sediment and vertebrate fish at the Site or anywhere else, given that it is well documented that fish metabolize PAHs to a greater extent than invertebrates (Meador et al. 1995). No reliable PAH PRG based on vertebrate fish consumption can be developed, and misapplication of the clam consumption PRG as a surrogate for fish consumption is not technically defensible. Fish have been shown to rapidly metabolize 99 percent of PAH compounds within 24 hours of uptake (Varanasi et al. 1989). Because fish metabolize PAH compounds so efficiently, fish tissue concentrations of PAH compounds have been deemed a poor means of assessing PAH exposure (McElroy et al. 2011; Van der Oost 2003; Johnson et al. 2002). The LWG has closely examined the Site PAH tissue and sediment data, and the data overwhelmingly support the wider literature on this subject. Further, there is precedent in EPA Region 10 at the Duwamish site for concluding that fish consumption PRG development is inappropriate for PAHs (AECOM 2012).

EPA apparently shared the LWG’s concern about the technical defensibility of a fish consumption PRG for PAH compounds because, after discussion with LWG and examination of the site data, EPA withdrew a vertebrate fish consumption-based PRG it had previously proposed in November 2013. The LWG can submit additional evaluations of the fish and sediment BaPEq data to EPA, if EPA has any continuing doubt about this conclusion.

EPA has also indicated it is engaged in an ongoing effort to examine fish tissue and sediment BaP concentrations to determine if there is a “floor” concentration observed in fish that can be related to a sediment value. BaP concentrations in fish tissue were not detected in most samples at levels above the tissue threshold from the BHHRA, and more than half of the detection limits were above the maximum detected value. This makes any resulting averages (or other statistics) very sensitive to the arbitrary value selected to represent non-detects. Consequently, EPA’s floor concentration evaluation would yield a floor concentration based mostly on the detection limits set at levels unrelated to any potential risk. EPA has recently indicated that it intends to use this

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

evaluation as a "check" for the clam consumption PRG, and EPA does not expect it to change the value of the proposed PRG. Regardless, due to the demonstrated lack of relationship between fish and sediment PAH data both at the Site and generally, any such floor value would still not represent any indication of protective sediment BaP concentrations for fish consumption. Consequently, the LWG requests that EPA discontinue any ongoing evaluations of the fish tissue data to calculate or verify PAH fish consumption PRGs.

Finally, EPA also presented a tissue-based threshold[4] for BaPEq of 0.05 µg/kg. This value appears to be based on a fish tissue toxicity threshold. Given that the sediment PRG is based on clam consumption, the tissue threshold should be derived using clam data instead.

7 - ECOLOGICAL SEDIMENT DIRECT CONTACT PRELIMINARY REMEDIATION GOALS FOR REMEDIAL ACTION OBJECTIVE 5

EPA's proposed PRGs for RAO 5 (ecological sediment direct exposure) include numerous PRGs that are based on individual benthic toxicity screening values (e.g., probable effects concentrations [PECs] and LRM sediment quality values [SQVs]). Such an approach is not consistent with the revised CBRA as recently provided by EPA. Fundamentally, if areas for remediation (SMAs) due to benthic risk are determined for the revised FS through the revised CBRA as EPA has indicated, the PRGs used to assess the performance of the alternatives in reducing benthic risks should also be based on the same CBRA. To do otherwise will result in revised FS determinations that active remediation of at least some of the CBRA areas failed to meet EPA's benthic-based PRGs (e.g., an individual PEC), which will lead to the erroneous conclusion that the alternative did not successfully address benthic risk.

Instead of using individual chemical sediment benthic PRGs for RAO 5, a PRG should be developed that is based on the CBRA. Specifically, the LWG recommends that the PRG be described as meeting two of the three predicted benthic toxicity thresholds that are used in the CBRA:

- LRM L3 Pmax less than 0.59
- FPM L3 MQ less than 0.7
- PEC MQ less than 0.7

Such an approach provides the most technically sound assessment of benthic toxicity that is consistent with the CBRA. This approach can be described in the PRG table as an explanatory footnote that is cited in the RAO 5 column for all contaminants that were used in the assessment of benthic risk for the above thresholds. Looking forward to design, the CBRA-based PRGs would be augmented by actual new bioassay data (where collected for design efforts) as another important line of evidence.

[4] The LWG has requested that EPA not refer to the tissue thresholds as PRGs, because EPA has indicated that they will not be used as performance goals. The LWG agrees that tissue thresholds should not be used as PRGs. Instead EPA has indicated it intends to use tissue thresholds as general information for comparisons to long term monitoring data. Consequently, to prevent potential confusion, the LWG requests that the tissue thresholds not appear in EPA's "PRG" table.

EPA has also noted in recent FS technical discussions that the single benthic screening values (e.g., a PEC) selected for many chemicals under RAO 5 are intended to be protective of not only the benthic community but other receptors that were found to have potentially unacceptable direct exposures to sediments in the BERA. EPA has provided no analysis explaining its method of determining that these individual benthic toxicity values are protective of other ecological receptors or which receptors EPA is assuming are protected in each case. The LWG disagrees that its own proposed approach is less protective of other ecological receptors than EPA's selection of individual toxicity values. The toxicity tests and contaminant concentration thresholds that are used in the CBRA are purposefully conservative so that they are protective of aquatic ecological communities.

8 - TECHNOLOGY SCREENING AND ASSIGNMENT

EPA and the LWG have discussed various aspects of remedial technology screening, selection criteria, selection scoring, and assignment to various areas of the Site. The LWG identified technology screening as a Section 2 issue, based on EPA's draft outline for the revised FS. EPA later indicated that the technology screening referred to in the Section 2 outline only pertained to broad screening of General Response Actions and technologies for the entire site. EPA also indicated it does not intend to describe in Section 2 the assignment or application of those technologies to any particular area of the Site (e.g., SMA or sub-SMA). Therefore, EPA identified technology assessment and assignment to various areas of the Site as a Section 3 issue and is postponing any further discussions on these issues.

The LWG believes it is critically important that technology screening and assignment be fully discussed early in the technical discussions and not delayed until Section 3 discussions. Several Section 3 issues have been discussed in similar or greater detail to date, including Principal Threat Waste, SDU analysis, SMAs, and contamination depths. At this juncture, the LWG requests that technology criteria, selection scoring, and assignment remain a priority for EPA's current evaluations and discussions with the LWG until these issues are fully resolved or, at a minimum, outstanding issues are fully identified.

In addition, MNR as a technology has not been a topic of any 2014 revised FS technical discussions, and EPA has indicated this issue would be discussed later in Section 4. MNR is a remedial technology that receives equal consideration in EPA guidance (EPA 2005) and should be discussed at the same time as, if not before, the other remedial technologies. Given that the evaluation of MNR is closely linked to an understanding of numerous site processes included in the conceptual site model (CSM), MNR needs to be discussed early in the process and made consistent with RI CSM discussions. Further, given the numerous site processes under consideration and the complexities of evaluating and making decisions regarding MNR, it is critical that adequate time is allowed to discuss and resolve this complex subject.

9 - SEDIMENT BACKGROUND STATISTICS

EPA is using RI Section 7 sediment background values based on inappropriate statistical analyses of upstream bedded sediment data for comparison to risk-based sediment PRGs in the revised FS Section 2 and potentially other purposes for later sections of the revised FS. During the draft final RI Section 7 discussions on sediment background, the LWG provided numerous technical objections to EPA's directed changes to the calculation of upstream bedded sediment background values, including issues related to organic carbon normalization and the selection of outliers (among other issues). The LWG accepted EPA's RI directions on background solely for the purposes of completing RI Section 7. For the purposes of the revised FS, the LWG disagrees for similar reasons that the RI background statistics were calculated appropriately and therefore represent technically accurate or reasonable background values for use in the revised FS.

As noted above, EPA guidance (EPA 2005) is clear that PRGs based on background (or risk) should be achievable by the sediment remedy itself. EPA's proposed background values based on inappropriately derived upstream bedded sediment statistics are unlikely to represent achievable levels for the Site. In the near future, the LWG will present to EPA under separate cover additional information on technically appropriate methods for calculating background statistics from upstream bedded sediment data that follows standard accepted statistical practices and are consistent with EPA's guidance. In addition, per Attachment 2, the LWG urges EPA to calculate equilibrium- based values for use throughout the revised FS as more representative of likely achievable background levels for the Site.

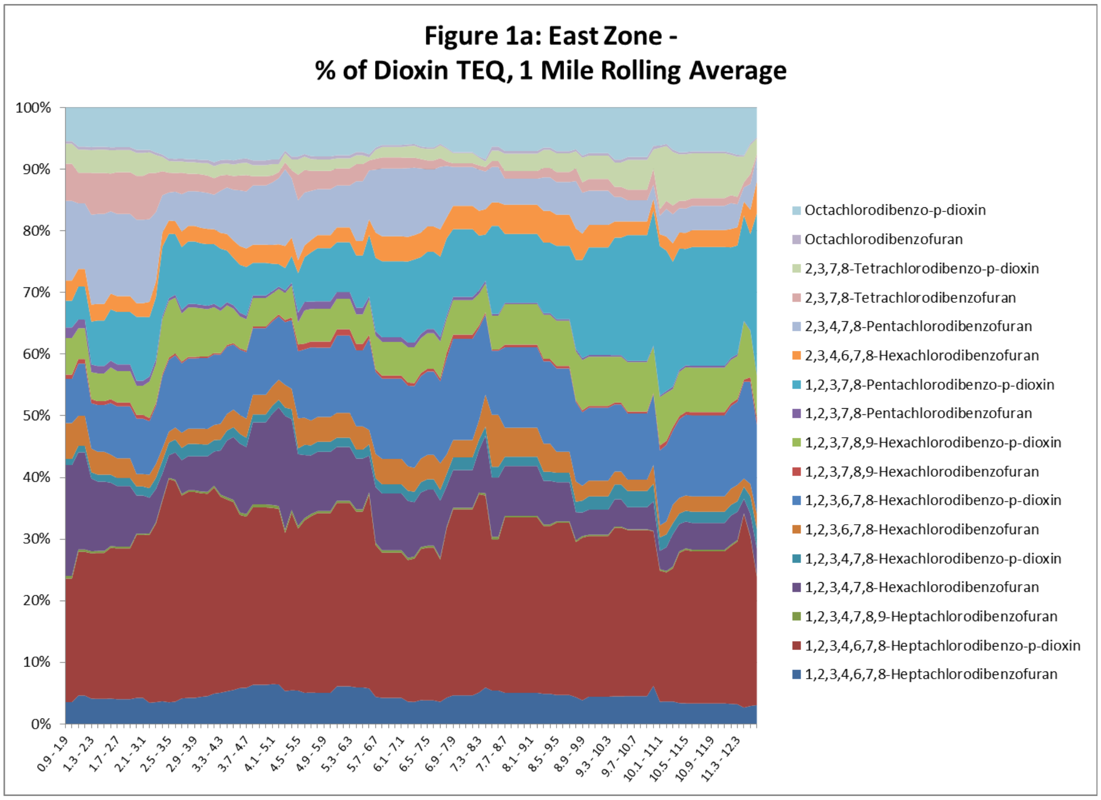


Figure 1a: East Zone -
% of Dioxin TEQ, 1 Mile Rolling Average
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.9 - 1.9
1.3 - 2.3
1.7 - 2.7
2.1 - 3.1
2.5 - 3.5
2.9 - 3.9
3.3 - 4.3
3.7 - 4.7
4.1 - 5.1
4.5 - 5.5
4.9 - 5.9
5.3 - 6.3
5.7 - 6.7
6.1 - 7.1
6.5 - 7.5
6.9 - 7.9
7.3 - 8.3
7.7 - 8.7
8.1 - 9.1
8.5 - 9.5
8.9 - 9.9
9.3 - 10.3
9.7 - 10.7
10.1 - 11.1
10.5 - 11.5
10.9 - 11.9
11.3 - 12.3
Octachlorodibenzo-p-dioxin
Octachlorodibenzofuran
2,3,7,8-Tetrachlorodibenzo-p-dioxin
2,3,7,8-Tetrachlorodibenzofuran
2,3,4,7,8-Pentachlorodibenzofuran
2,3,4,6,7,8-Hexachlorodibenzofuran
1,2,3,7,8-Pentachlorodibenzo-p-dioxin
1,2,3,7,8-Pentachlorodibenzofuran
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin
1,2,3,7,8,9-Hexachlorodibenzofuran
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin
1,2,3,6,7,8-Hexachlorodibenzofuran
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin
1,2,3,4,7,8-Hexachlorodibenzofuran
1,2,3,4,7,8,9-Heptachlorodibenzofuran
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin
1,2,3,4,6,7,8-Heptachlorodibenzofuran

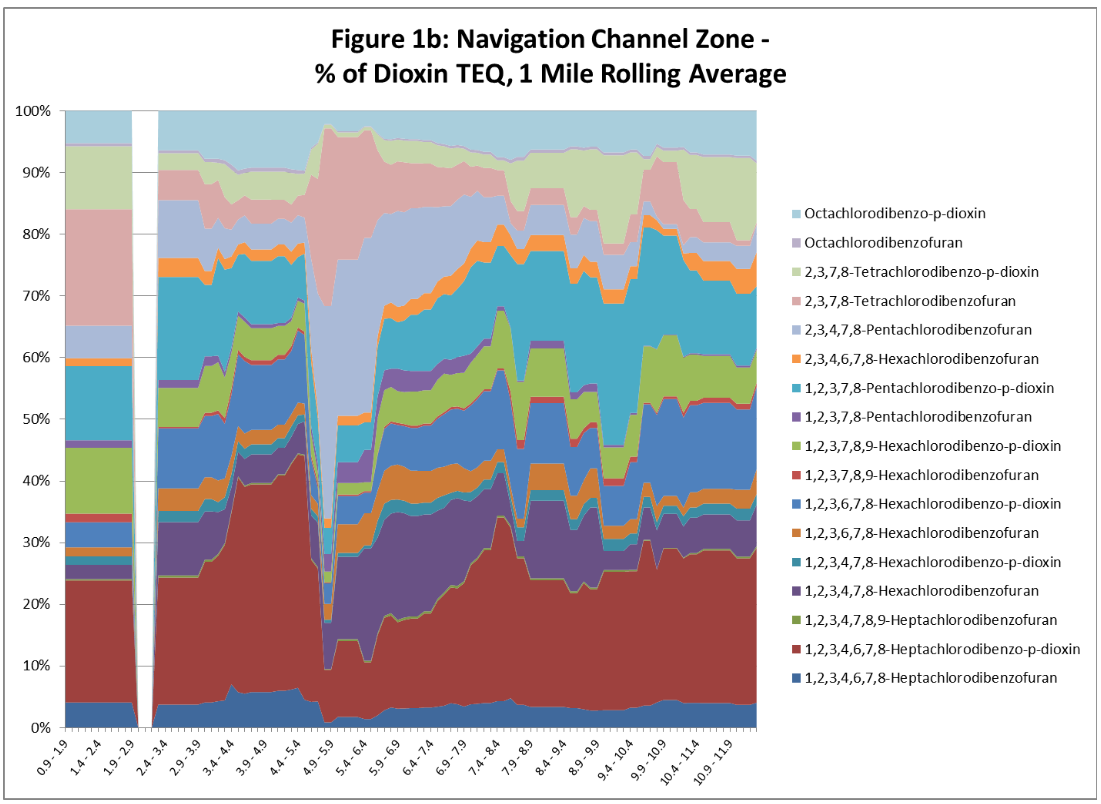


Figure 1b: Navigation Channel Zone -
% of Dioxin TEQ, 1 Mile Rolling Average
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.9 - 1.9
1.4 - 2.4
1.9 - 2.9
2.4 - 3.4
2.9 - 3.9
3.4 - 4.4
3.9 - 4.9
4.4 - 5.4
4.9 - 5.9
5.4 - 6.4
5.9 - 6.9
6.4 - 7.4
6.9 - 7.9
7.4 - 8.4
7.9 - 8.9
8.4 - 9.4
8.9 - 9.9
9.4 - 10.4
9.9 - 10.9
10.4 - 11.4
10.9 - 11.9
Octachlorodibenzo-p-dioxin
Octachlorodibenzofuran
2,3,7,8-Tetrachlorodibenzo-p-dioxin
2,3,7,8-Tetrachlorodibenzofuran
2,3,4,7,8-Pentachlorodibenzofuran
2,3,4,6,7,8-Hexachlorodibenzofuran
1,2,3,7,8-Pentachlorodibenzo-p-dioxin
1,2,3,7,8-Pentachlorodibenzofuran
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin
1,2,3,7,8,9-Hexachlorodibenzofuran
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin
1,2,3,6,7,8-Hexachlorodibenzofuran
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin
1,2,3,4,7,8-Hexachlorodibenzofuran
1,2,3,4,7,8,9-Heptachlorodibenzofuran
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin
1,2,3,4,6,7,8-Heptachlorodibenzofuran

Figure 1c: Swan Island Lagoon Zone - % of Dioxin TEQ, 1 Mile Rolling Average

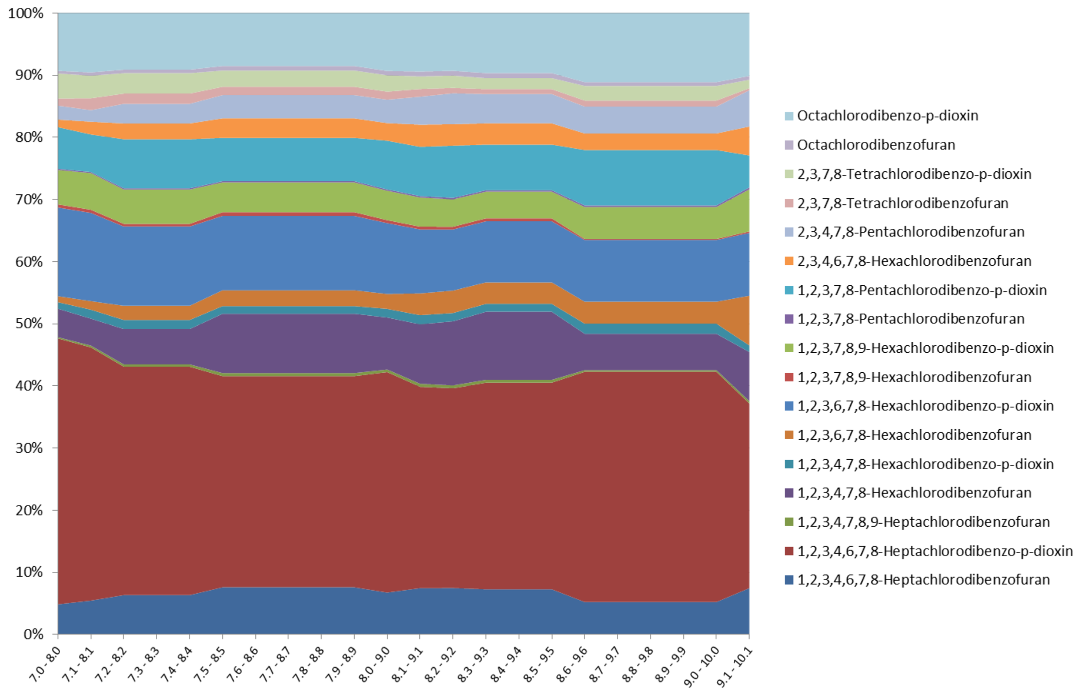
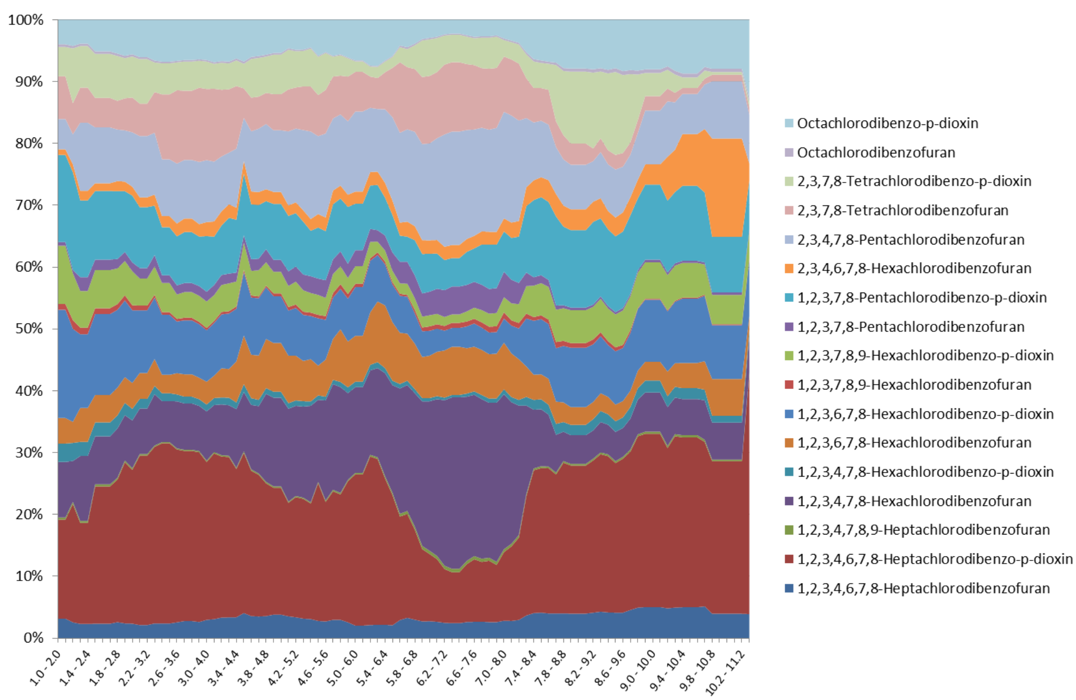


Figure 1d: West Zone - % of Dioxin TEQ, 1 Mile Rolling Average



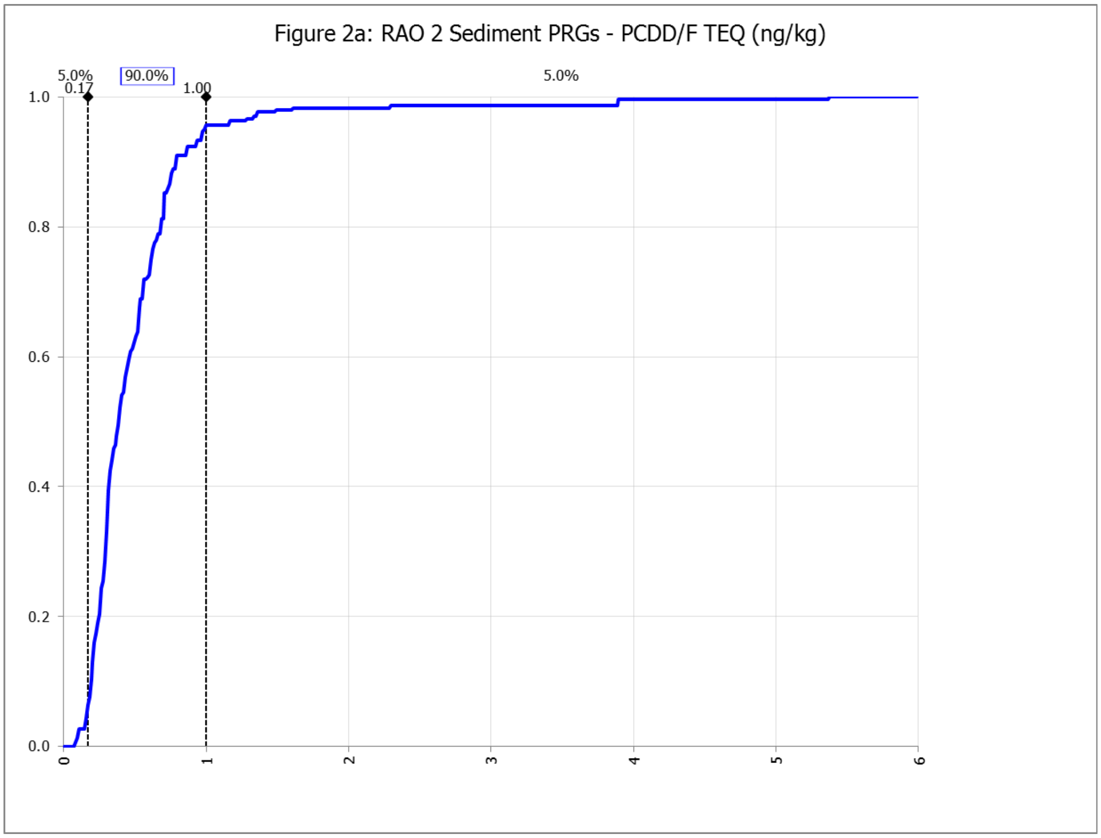


Figure 2a: RAO 2 Sediment PRGs - PCDD/F TEQ (ng/kg)
5.0%
90.0%
5.0%
0.17
1.00
1.0
0.8
0.6
0.4
0.2
0.0
0
1
2
3
4
5
6

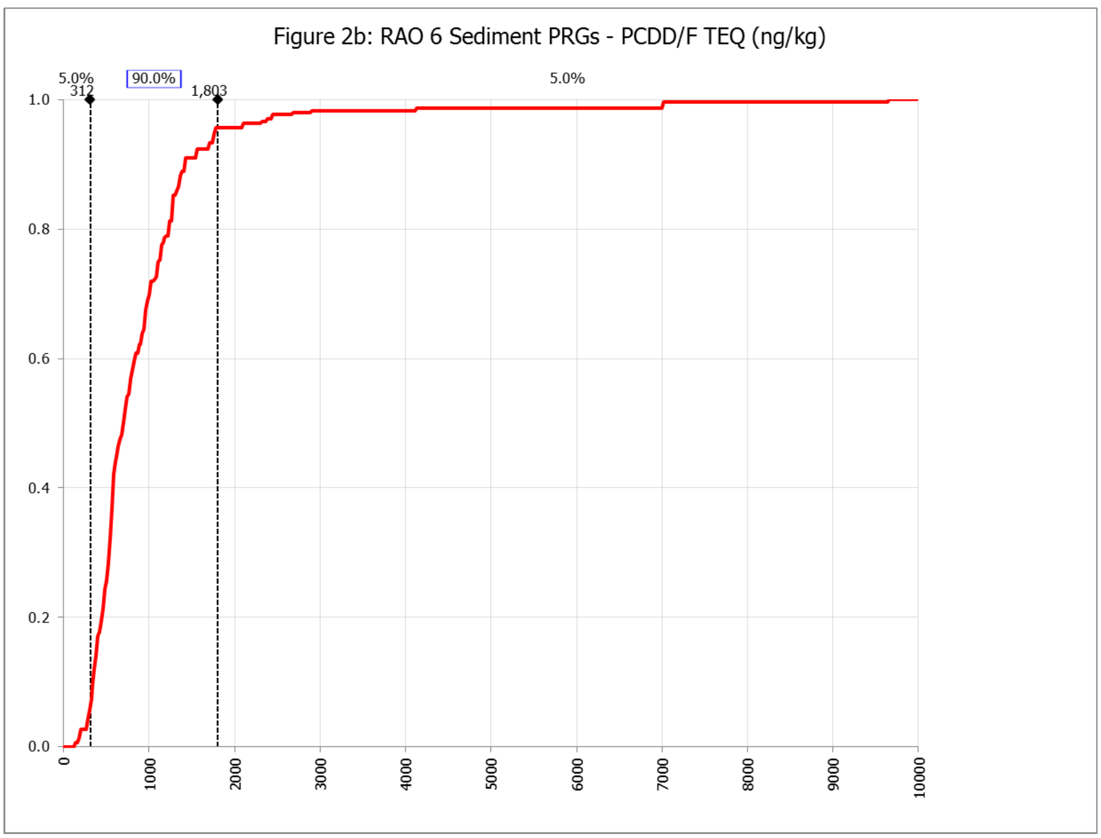


Figure 2b: RAO 6 Sediment PRGs - PCDD/F TEQ (ng/kg)
5.0%
90.0%
5.0%
312
1,803
1.0
0.8
0.6
0.4
0.2
0.0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000

REFERENCES

AECOM, 2012. Final Feasibility Study Lower Duwamish Waterway, Seattle Washington. Submitted to U.S. EPA Region 10 and Washington State Department of Ecology. Prepared on behalf of Lower Duwamish Waterway Group. Seattle, Washington.

Davison, W. and C. Woof, 1984. A study of the cycling of manganese and other elements in the seasonally anoxic lake, Rostherene Mere, U.K. Water Resources 18:6, 727-734.

Donahoe, R.J. and Liu, C. 1998. Pore water geochemistry near the sediment-water interface of a zoned, freshwater wetland in the southeastern United States. Environmental Geology 33:143-153.

EPA, 1991. Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions, p. 3 (OSWER Directive 9355.0-30, April 22, 1991).

EPA, 2002. Transmittal of Policy Statement: "Role of Background in the CERCLA Cleanup Program." From Michael B. Cook, Director of Office of Emergency and Remedial Response to Superfund National Policy Managers Regions 1-10. OSWER 9285.6-07P. May 1, 2002, Washington, D.C.

EPA, 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites. OSWER Publication 9355.0-85 DRAFT. United States Environmental Protection Agency, Office of Solid Waste and Emergency Response. Washington, D.C.

Johnson, L.L., T.K. Collier, and J.E. Stein, 2002. An Analysis in Support of Sediment Quality Thresholds for Polycyclic Aromatic Hydrocarbons (PAHs) to protect estuarine fish. Aquatic Conservation: Marine and Freshwater Ecosystems 12 (5):517-538.

Madison, A.S., B.M. Tebo, A.M. Mucci, B. Sundby, and G.W. Luther III, 2013. Abundant porewater Mn(III) is a major component of the sedimentary redox system. Science 341:875-878

McElroy, A.E., M.G. Barron, N. Beckvar, S.B.K Driscoll, J.P. Meador, T.F. Parkerton, T.G. Preuss, and J.A. Steevens, 2011. A review of the tissue residue approach for organic and organometallic compounds in aquatic organisms. Integr Environ Assess Manag 7:50-74.

Meador, J.P., J.E. Stein, W.L. Reichert, and U. Varanasi, 1995. Bioaccumulation of polycyclic aromatic hydrocarbons by marine organisms. Reviews of Environmental Contamination and Toxicology 143:79-164.

Moore, B.C., Lafer, J.E., and Funk, W.H. 1993. Influence of aquatic macrophyters on phosphorus and sediment porewater chemistry in a freshwater wetland, Aquatic Botany, 49:137-148.

Stauffer, R.E., 1987. A comparative analysis of iron, manganese, silica, phosphorous, and sulfur in the hypolimnia of calcareous lakes. Water Resources 21:9, 1009-1022.

Van der Oost, R., J. Beyer, and N.P.E. Vermeulen, 2003. Fish bioaccumulation and biomarkers in environmental risk assessment: a review. Environ Toxicol Pharmacol 13:57-149.

Varanasi, U., J.E. Stein, and M. Nishimoto, 1989. Biotransformation and Disposition of Polycyclic Aromatic Hydrocarbons (PAHs) in Fish: In Varanasi U (ed.) Metabolism of Polycyclic Aromatic Hydrocarbons (PAHs) in the Aquatic Environment. CRC Press, Boca Raton, Florida, pp 94-149.

DO NOT QUOTE OR CITE
This document is currently under review by EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Wildman, R.A., Chan, N.W., and Dalleska, N.F., 2010. Effect of changes in water level on sediment pore water redoc geochemistry at a reservoir shoreline. Applied Geochemistry, 25:12, 1902-1011.

Chairperson: Bob Wyatt, NW Natural
Treasurer: Frederick Wolf, DBA, Legacy Site Services for Arkema

March 25, 2015

Kristine Koch
U.S. Environmental Protection Agency, Region 10
1200 Sixth Avenue, Suite 900, M/S ECL-115
Seattle, Washington 98101-3140

Re: LWG Comments on Revised FS Section 2 (Lower Willamette River, Portland Harbor Superfund Site, USEPA Docket No: CERCLA-10-2001-0240)

Dear Ms. Koch:

This submittal (with attachments) transmits the LWG's technical comments on revised FS Section 2. EPA provided its proposed revised Section 2 of the FS to the LWG for review on February 23, 2015. Per the revision process provided by EPA on December 17, 2014, the LWG has 30 days to review each FS section and identify any technical issues with the text, tables, and figures EPA has drafted. The LWG and the EPA RPM now have 15 days to resolve issues on this section, although EPA may grant additional time on a case-by-case basis.

This input is part of the LWG's and EPA's efforts to reach consensus and develop a technically sound revised FS. The comments provided herein, while certainly addressing many of the most important issues that have become apparent from the LWG's 30-day review of draft FS Section 2 and recent discussions with EPA, may not be comprehensive but are submitted now so as to comply with the FS review process.

In general, as explained in detail in our comments and our meeting with EPA on March 17, 2005, the LWG has significant concerns about EPA's overall vision for revising the FS based on EPA's draft FS Section 2. For example, based on our recent Section 2 discussions, EPA generated PRGs with little or no apparent consideration of risk management principles and significantly modified previously agreed-upon RAO text. We strongly encourage EPA to apply risk management principles now to ensure that achievable remediation goals are selected consistent with the NCP and EPA's sediment remediation guidance.

We sincerely hope this information will be valuable to EPA as it undertakes the process of developing its final directions for changes to FS Section 2. We and our consultants remain available to discuss with EPA any issue we have raised here.

Sincerely,

Bob Wyatt

cc: Sean Sheldrake, U.S. Environmental Protection Agency, Region 10
Confederated Tribes and Bands of the Yakama Nation
Confederated Tribes of the Grand Ronde Community of Oregon
Confederated Tribes of Siletz Indians of Oregon
Confederated Tribes of the Umatilla Indian Reservation
Confederated Tribes of the Warm Springs Reservation of Oregon
Nez Perce Tribe
Oregon Department of Fish & Wildlife
United States Fish & Wildlife
Oregon Department of Environmental Quality
LWG Legal
LWG Repository

LWG COMMENTS ON EPA'S FEASIBILITY STUDY REVISED DRAFT SECTION 2 TEXT

This document contains the Lower Willamette Group's (LWG) comments on the U.S. Environmental Protection Agency's (EPA) draft revised Feasibility Study (FS) Section 2. EPA provided a draft revised FS Section 2 to the LWG on February 23, 2015. EPA also provided two separate errata for the draft on February 27, 2015, additional errata on March 2, 2015, and a revised Table 2.1.2 (regarding Applicable or Relevant and Appropriate Requirements; ARARs) on March 5, 2015.

As a general matter, the LWG continues to be concerned with EPA's approach to the Site. The NCP and EPA's sediment guidance provide ground rules for evaluating and selecting reasonable cleanups. Specifically, the FS process "lays the groundwork for proposing and selecting a remedy for the site that best eliminates, reduces, or controls risks to human health and the environment" (EPA 2005). More than three years ago the LWG provided a comprehensive, well-documented, fully supported draft FS that was consistent with both the NCP and EPA guidance. EPA's draft revised FS Section 2 departs sharply from this approach and provides overly generic text that does not lay the foundation necessary to support an implementable cleanup alternative providing the best balance of remedy selection criteria. The FS must comply with the NCP and follow EPA guidance, including compliance with risk management principles, when identifying the scope and extent of the cleanup and considering short-term impacts, feasibility, and cost in the development and evaluation of cleanup alternatives. Short-term impacts, feasibility, and cost are not afterthoughts. Deferring adherence with the NCP and EPA guidance as detailed in the specific comments below until the last section of the draft FS will likely be too late in the process to credibly achieve this requirement. This document presents a list of major comments on EPA's draft revised FS Section 2. The list of comments can be categorized into the following overall LWG concerns:

1. Determination of equilibrium values that can be used as the basis for what is achievable over the long term by a sediment remedy itself, considering appropriate and realistic factors for an urban waterway like Portland Harbor. Specific comment numbers: 2, 3, 4, 5, and 12.

2. The contaminants of concern and the exposure scenarios and spatial scales used to establish preliminary remediation goals that are consistent with the methods and findings of the risk assessments, based on technically sound principles, and apply risk management principles set forth in EPA guidance. Specific comment numbers: 1, 6, 7, 8, 9, 10, 13, 16, 17, 18, 19, 20, and 25.

3. Development of remedial action objectives that are focused on achieving reduction of significant risks, not contaminant mass removal, and what is achievable by sediment remedy itself. Specific comment numbers: 14 and 15.

4. Presentation and characterization of technologies reflecting a balanced view of the inherent benefits, limitations, and effectiveness of each technology with appropriate consideration of site-specific information and analysis. Specific comment numbers: 11, 21, 22, 23, and 24.

The list of specific comments are split into two major categories. The first category comprises Section 2 comments and issues that the LWG submitted to EPA in June 2014[1], which EPA has not addressed or incorporated into Section 2. The second category consists of comments identifying additional or new comments based on our review of EPA's draft revised FS Section 2.

MAJOR EPA-UNADDRESSED ISSUES FROM LWG'S JUNE 2014 COMMENTS

The following subsections describe continuing LWG concerns regarding Section 2 issues raised with EPA by LWG in June 2014.

1. Contaminants of Concern (COCs) and Preliminary Remediation Goals (PRGs)

COCs and PRGs should only be selected for those contaminants and exposure scenarios identified as being site-related and posing potentially unacceptable risk in the approved baseline human health and ecological risk assessments. Then, from among that list of PRGs, the FS should *focus* on PRGs for which acceptable risk levels can be achieved through a sediment-only cleanup. The June 2014 comments detail examples and specific issues related to the LWG's concerns on these points. Also, the June 2014 comments note regarding ARARs that EPA guidance states the following:

> "As a general policy and in order to operate a unified Superfund program, EPA generally uses the results of the baseline risk assessment to establish the basis for taking a remedial action using either Section 104 or 106 authority. If the baseline risk assessment and the comparison of exposure concentrations to chemical-specific standards indicates that there is no unacceptable risk to human health or the environment and that no remedial action is warranted, then the CERCLA Section 121 cleanup standards for selection of a Superfund

[1] LWG submitted these comments in anticipation of EPA's draft revised FS Section 2 based on information obtained during the 2014 FS technical meetings. Rather than restate all of the LWG's June 19, 2014 comments here, we incorporate them by this reference.

> remedy, including the requirement to meet applicable or relevant and appropriate requirements (ARARs), are not triggered" (EPA 1991).

While EPA has made a first step toward focusing the PRG list in its analysis in Table 2.1-2 "Summary of COC Selection Process," EPA has not fully not addressed this prior LWG comment and continues to include in Section 2 many non-risk-based PRGs and PRGs for media that do not clearly relate to site-related releases, exposure pathways posing risk, or to a sediment-only cleanup. For example, in Table 2.1-3, EPA notes numerous PRGs that were selected because they are "S – Known upland source not evaluated in the risk assessment" or "M – Media associated with exposure point risk." These chemicals were not necessarily found to pose risk in the media for which a PRG was designated, and therefore, should not have PRGs for these media for the sediment remedy.

2. Sediment Background Concentrations and Equilibrium Levels

Development and use of sediment background concentrations in the FS should be consistent with the conceptual site model for the Portland Harbor Superfund Site (Site) based on the data collected. In June 2014, the LWG provided an attachment to the comments describing the need for development of "equilibrium" levels for Portland Harbor that used other methods beyond EPA's directed statistical analyses of upstream sediment background data. EPA has not responded in writing to the LWG's proposal, although it has indicated orally that this concept would be considered for FS Section 4. The LWG continues to recommend that the equilibrium concept be factored into PRG selection because equilibrium levels represent reasonably achievable sediment concentrations for the harbor. EPA sediment remediation guidance is clear that Remedial Action Objectives (RAOs), PRGs, Remedial Goals (RGs), and eventual cleanup levels should represent values that are achievable by implementation of the sediment remedy alone (EPA 2005; p. 2-15).

3. PRG Consistency with Risk Assessments and Risk Management Principles

Risk-based PRGs for evaluating cleanup alternatives should be consistent with the spatial scales of the exposure scenarios used to characterize risk in the approved baseline human health and ecological risk assessments. Risk-based PRGs should also be developed based on technically sound principles and application of risk management principles, as called for in EPA's regulation and guidance (see LWG's June 2014 comments for guidance quotes). Per these precepts, the LWG had requested that EPA greatly reduce the number of COCs and PRGs consistent with its practice at other sediment remediation sites. Instead EPA increased the number of COCs and PRGs since the last PRGs table was made available to the LWG.

For example, in Section 2.2.1, EPA indicates that "[c]ontaminants found to pose a lifetime cancer risk greater than 1×10^{-6} or hazard quotients (HQs) greater than 1 were identified as contaminants posing unacceptable risks." As a matter of risk management, this approach is the most conservative that EPA could apply. The National Contingency Plan (NCP) incorporates a flexible threshold for EPA's determination of risk acceptability. Risks greater than $1x10^{-4}$ generally require remediation, risks less than $1x10^{-6}$ are generally considered acceptable, and risks between these values may or may not require action depending on site-specific circumstances. (Further, as discussed more below, this text should be changed to "posing <u>potentially</u> unacceptable risks" [emphasis added] in order to be consistent with the risk assessments.) Also, EPA notes in Section 2.2.2.1, "The [risk-based PRGs] were developed for COCs in sediment and biota tissue, assuming target cancer risk levels of 10^{-6} and 10^{-4}, and a target non-cancer Hazard Quotient of 1, for each of the receptors evaluated in the BHHRA and using the methodology described in Appendix B1." However, the human health PRG Tables 2.2-4 through 2.2-7 do not show any PRGs based on a cancer risk level of 10^{-4}. These PRGs are only presented in the appendices and should be moved forward into the main text tables.

In 2012, EPA Headquarters asked the LWG to obtain additional Small Mouth Bass (SMB) fish tissue samples from the site and from upstream areas that overlap with background sediment sampling locations. The LWG obtained and analyzed these samples. When the human health risk associated with the consumption of resident fish (SMB) from the upstream samples is calculated, cancer risk levels are present in the range of 10^{-5} and Hazard Quotients that in some cases exceed 50. Accordingly, regardless as to the methods used to calculate sediment background concentrations, these data demonstrate that health risk associated with the consumption of resident fish (SMB) from background areas exceed the higher-end criteria of acceptability (greater than 10^{-6} in the case of cancer risk and Hazard Quotients greater than 1 in the case of non-cancer risks). Based on the 2012 fish tissue data, at least 5 miles of the site extending from River Mile (RM) 4 through RM 8 are already within the risk range associated with consumption of the upstream fish. EPA's policy concerning background risk is straightforward:

> "Generally, under CERCLA, cleanup levels are not set at concentrations below natural background levels. Similarly, for anthropogenic contaminant concentrations, the CERCLA program normally does not set cleanup levels below anthropogenic background concentrations" (EPA 2002).

It is essential that Region 10 base its cleanup levels on the actual background conditions and risks as evidenced in both the 2002 and 2012 Upstream Fish Tissue Data.

Also, it appears that EPA is still calculating and applying many PRGs on spatial and temporal scales that are inappropriate based on the exposure assessment in the BLRAs or on the legal application of potential Applicable or Relevant and Appropriate Requirements (ARARs). For example, EPA presents Figure 2.2-2 entitled "Comparison of Risk Areas to be Remediated," which appears to define "remediation areas" based on a point-by-point (in both time and space) application of all PRGs developed by EPA. Also, in Section 2.2.2.2, EPA indicates that "[t]he lowest value for each media was selected as the risk-based PRG for RAOs 5 and 6 to be protective of all potential receptors." However, the PRGs for different ecological receptors are applied on different spatial scales, so applying the lowest PRG to individual locations throughout the harbor is inconsistent with how BLRAs were conducted.

To the extent that PRGs in Table 2.2-1 "Summary of Portland Harbor PRGs by RAO and Media" are based on potential Oregon ARARs, they need to be applied in the manner those potential ARARs would be applied under Oregon law. *See LWG, Background Document: Application of Oregon Water Quality Standards, Tab 7 (provided to EPA July 7, 2008).* For example, cadmium was identified as a COPC in the BERA, and its PRG in Table 2.2-1 for RAO 7 (aquatic direct contact/ingestion) is set by reference to Oregon toxics criteria for aquatic protection, OAR 340-041-0033, Table 30. With respect to the temporal application of this criteria, Table 30 notes that these Oregon criteria are not to be applied based on single grab samples. Rather, they are applied "as a 96-hour (4 days) average concentration [which] should not be exceeded more than once every three years." With respect to the spatial scale of application, this criteria would not be applied on a point-by-point basis, but rather would include application of the implementation provisions of Oregon's water quality standards including, for example, use of regulatory mixing zones. *Id., Tab 7 at 8-9 and Tab 8*. Finally, EPA's Table 2.2-1 also appears to apply toxics criteria from OAR 340-041-0033, Table 30, to porewater, which is an application that would not be made under Oregon law.

Also, EPA indicates in Section 2.2.2.1, "The risk-based PRGs for RAOs 1 and 2 represent the lowest value in each media (beach or in-water sediment, and fish/shellfish tissue) to be protective of all potential receptors." However, this direct comparison is inappropriate because these PRGs should not be applied the same way if the comparison is to be consistent with the BHHRA. The lowest value selected across all scenarios may not be appropriate to apply in certain areas or over certain spatial scales. For example, recreational beach user PRGs only apply to recreational beaches, and fish consumption PRGs are for subsistence fishers only (which is generally a site-wide exposure). Showing the lowest value by media loses the context for how the PRGs should be applied.

Do Not Quote or Cite
This document is currently under review by US EPA and its federal, state and tribal partners, and is subject to change in whole or part

Similarly, EPA indicates in Section 2.2.2.1, "EPA regional screening levels (RSLs) for tap water (EPA 2014) were used as the risk-based PRGs for RAOs 3 and 4." However, only a few chemicals were found to pose potentially unacceptable risk in the BHHRA for the scenarios addressed by RAO 3, and no chemicals were found to pose potentially unacceptable risk for scenarios addressed by RAO 4. Consequently, risk-based levels are not necessary or appropriate for most of the chemicals listed by EPA for RAO 3, nor are risk-based levels necessary for RAO 4. (And for reasons noted in the LWG's June 2014 comments, the LWG disagrees that PRGs are needed for the groundwater RAOs at all.)

These are just a few examples of EPA performing evaluations that ignore reasonable risk management approaches or are inconsistent with the BLRAs or with the basis for the potential ARARs which EPA appears to be applying, which severs the link to a risk-based cleanup as clearly called for in the guidance (EPA 2005; p. 1-5).

4. Background Values for Surface Water and Transition Zone Water (TZW)

EPA should develop background values for surface water using available upstream surface water data and develop background values for TZW using the considerable body of research literature from other sites regarding the concentrations of contaminants in non-CERCLA or non-contaminated sites. Currently, EPA's draft revised FS Section 2 presents many surface water and TZW (which EPA referred to as "porewater") PRGs that are well below likely ambient surface water (e.g., upstream river water) and TZW levels; therefore, these PRGs are unachievable, which is inconsistent with guidance. Specifically, EPA guidance (2005: p. 2-15) indicates that RAOs should be achievable by the site cleanup itself. PRGs are the numeric expression of the RAOs as EPA describes in revised FS Section 2.2.

5. Background Values for Dioxin/Furan (D/F) Sediment PRGs

Ultimately, the remediation goals should consider the risk-based PRGs and background. The LWG requested that EPA compare the D/F sediment PRGs to background and, as required, adjust the PRGs to background. EPA subsequently indicated in FS technical meetings that EPA considered the background dataset to have too many non-detects to calculate valid background values. EPA established detection-limit-based PRGs instead for some D/F congeners. The LWG understands that there is a relatively high level of non-detects in the background dataset; however, valuable information is contained within that dataset regarding detectable levels of D/Fs found upstream of the Site that clearly relates to achievable levels within the Site. If this dataset is used consistent with the equilibrium concept discussed previously, some of the rigid statistical requirements EPA is concerned about could be addressed through other means to provide an understanding of background conditions. At a minimum, understanding the range of background concentrations and the potential for upstream contributions is critical to evaluating remedy feasibility and effectiveness. Basing D/F PRGs on extremely low risk-based or detection limit values that may be below the range of background conditions continues to overlook the guidance requirement for achievable RAOs (EPA 2005; p. 2-15) and PRGs (which are the numeric expression of RAOs), and will very likely result in the establishment of remedial levels that are unattainable.

6. Evaluate Remedial Alternatives with PRGs Applied on Appropriate Spatial Scales

The LWG requested that EPA evaluate remedial alternatives using risk-based PRGs applying the same spatial scales as the risk calculations in the risk assessments. EPA has indicated that this issue will be addressed in FS Section 4. Given that EPA's draft revised Section 2 already has examples of misapplication of the PRGs (see Comment 3), the LWG urges EPA to begin discussions on this issue now in order to ensure an adequate foundation for the significant technical evaluations necessary to adequately evaluate appropriate spatial scales in Sections 3 and 4.

7. Include the Site Use Factor in Calculation of Sediment Direct Contact PRGs

The LWG requested that EPA include the site use factor in the calculation of the sediment direct contact PRGs for fisher scenarios used by EPA to develop PRGs under RAO 1, consistent with the BHHRA. EPA continues to exclude the site use factor in the PRG calculation, which is inconsistent with the EPA-approved BHHRA. The oral justification for excluding the site use factor that EPA provided in FS technical discussions was that the in-water sediment PRGs would not necessarily be protective of the fisher scenarios if the site use factor was included. It is unclear to the LWG how the BHHRA risks can be calculated correctly with inclusion of the site use factor for this scenario, while a PRG back-calculated in the identical manner would somehow not be protective for this scenario.

8. Calculation of D/F PRGs in Sediment

The LWG proposed some general methods for calculating D/F risk-based PRGs in the June 2014 comments. EPA moved ahead with a D/F PRG development approach, which is described in a CDM Smith working draft memorandum dated December 23, 2014. The LWG disagrees with the PRG methods described in this memorandum for numerous reasons, which can be fully described if necessary. In summary, some key reasons for our disagreement include:

- The models that EPA used to develop PRGs are initial calibrations that have not yet been checked and adjusted for consistency in parameterization across calibrated congener models.

- In selecting congeners for PRG development EPA ignored two of the three congener selection considerations that the LWG developed collaboratively with EPA in 2009.
- EPA failed to recognize clear spatial patterns of congener concentrations in smallmouth bass tissue. It developed a PRG methodology on the false assumption that such patterns did not exist.
- EPA correctly noted the lack of correlations between sediment and tissue congener concentrations, yet applied a PRG approach that depends on the assumption that sediment congener SWACs and tissue congener concentrations are correlated.

9. Benzo(a)Pyrene Equivalent (BaPEq) PRG for Shellfish Consumption

The LWG requested that EPA express the BaPEq PRG based on human health clam consumption (RAO 2) on an organic carbon normalized basis, similar to the Focused PRGs EPA provided for the draft FS. The LWG also requested that EPA not use the clam consumption PRG as a "surrogate" for vertebrate fish consumption because it is not in any way applicable to a fish consumption scenario. EPA has neither revised the PRGs to address this comment nor explained the technical basis for its approach.

10. Benthic Risk PRGs Should Be Based on the Comprehensive Benthic Risk Area (CBRA) Approach

The LWG requested that, instead of using individual chemical sediment benthic PRGs for RAO 5, EPA develop a PRG that is based on the CBRA approach, to which EPA previously agreed. Specifically, EPA's letter on February 25, 2011 states, "All significant issues regarding use of the LRM and EPA's comments were resolved in principle as of December 13, 2010. The benthic approach agreed to is documented in Attachment B to LWG's January 12, 2011 letter. EPA is in general agreement with the approach as described in Attachment B to the LWG's letter with some clarifications that are provided as an enclosure to this letter." In addition, EPA approved the Final BERA, which concludes that "[p]otentially unacceptable benthic risks are highly associated with shoreline areas, slips, and areas of elevated chemical concentrations and represent approximately 7% of the total Study Area." EPA's approach of using individual SQVs as benthic PRGs will result in identification of potentially unacceptable benthic risk in the revised FS that is completely inconsistent with the EPA-approved findings in the BERA. In the June 2014 comments, the LWG made a specific recommendation regarding methods to derive PRGs consistent with the CBRA, but EPA did not make any related changes to its benthic PRG methods.

DEQ indicated in the March 17, 2015 meeting with EPA and LWG on Section 2 that there should be consistency between the RAO 5 PRGs and the CBRA (or alternatively to a benthic risk approach that the parties finally agreed to). The LWG agrees with DEQ that there needs to be consistency between the RAO 5 PRGs and the CBRA. It is confusing and inconsistent for EPA to define Sediment Management Areas (SMAs) using the CBRAs (which is presumably still EPA's intent), and then present an entirely different and technically inappropriate method for deriving benthic risk PRGs.

EPA's draft revised Section 2 further highlights the LWG's ongoing concern, given that EPA appears to have used individual benthic PRGs in Figure 2.2-2 to identify apparent ecological risk areas that are completely inconsistent with the agreed to CBRAs. Benthic risk PRGs are used in the development of this figure, which suggests that benthic risk exists over much greater than 7% of the total Study Area as concluded in the EPA-approved BERA. EPA indicated in the March 17, 2015 meeting on Section 2 that EPA intends the PRGs under RAO 5 to be surrogates for all ecological sediment direct contact risks. However, the vast majority of the RAO 5 PRGs are based on benthic risk endpoints and do not provide any direct indication of potentially unacceptable risks for other ecological receptors.

11. Technology Criteria, Scoring, and Technology Assignments

The LWG requested in 2014 that EPA discuss with the LWG the issues of technology criteria, selection scoring, technology assignment, and, in particular, the evaluation of monitored natural recovery (MNR), which was not discussed in any of the 2014 FS technical meetings. EPA proceeded with development of a draft technology screening subsection within Section 2. The LWG views much of the draft technology screening discussion in the draft revised FS Section 2 as a biased and selective description of the pros and cons of many of the technologies. Additionally, the screening discussion lacks necessary site-specific information and analysis. EPA guidance states that the technology screening process step is site specific and should be based upon information from the RI site characterization (EPA 1988: p. 4 – 16).

The LWG recommends that EPA employ an approach to describing the pros and cons of each technology similar to EPA's recent Community Advisory Group (CAG) presentation on MNR, which included pros and cons side by side using text from EPA's sediment remediation guidance. The LWG recommends that a similar approach for general technology screening be used in Section 2, and this should replace much of the relatively subjective text currently presented by EPA for these technologies. Because such pros and cons would be directly from guidance, this would ensure LWG and EPA agreement with the general evaluations of each technology in Section 2. The one exception to using the 2005 guidance is for in situ treatment, where the guidance is outdated (see Comment 22).

ADDITIONAL OR NEW MAJOR ISSUES

The following subsection presents additional major issues that the LWG has identified now that a draft of the revised Section 2 is available for review. Some of these issues are related to the previous comments summarized above, but the following comments discuss some new aspects of the LWG's concern based on EPA's draft revised Section 2.

12. Additional PRG Changes

EPA made numerous new changes to the PRGs tables since the last version provided by EPA to the LWG on August 6, 2014. At that time, EPA noted that the PRGs were still under evaluation and subject to change. However, given that the PRGs table for the revised FS had been under development by EPA since November 2013 (when EPA first presented a version of the PRGs for the revised FS), and EPA provided and discussed with the LWG multiple iterations of the PRGs, the LWG had a reasonable expectation that any additional changes to the PRGs would be relatively minor. Instead, EPA's draft revised Section 2 Table 2.2-1 contains 196 numeric PRGs, with 80 of the values presented are different from those presented in the draft table on August 6, 2014. Also, as noted above, the number of COCs and PRGs has increased since the last PRGs table, indicating that EPA is not using risk management principles as is commonly done at other sediment cleanup sites.

Conversely, many of the specific changes recommended by LWG have not been adopted. A particularly problematic (but not the only) example is that EPA made no changes to the manganese water PRG for RAO 8. The LWG submitted a very detailed technical analysis on August 1, 2014, indicating needed changes to this PRG, which EPA indicated it was willing to consider. EPA indicated at the March 17, 2015 meeting that EPA intended to change this PRG and not doing so was an oversight. The LWG recently re-submitted to EPA our specific request regarding changes to this PRG.

In general, the LWG requests that it be provided the rationale and calculations that were used to develop the revised PRGs for existing PRGs that were altered in the table.

13. Changes to RAOs Text

EPA made new major changes to the RAOs, which were not discussed in the 2014 FS technical meetings. The draft FS RAO text was laboriously discussed, and the LWG and EPA exchanged multiple comments and responses from January to September 2009 to refine and finalize the RAO text. The LWG comments included text on "additional considerations" that further explain the RAOs, which EPA agreed would accompany the RAO text. EPA provided very little explanation at the March 17, 2015 meeting for why these prior agreements and EPA directions

Do Not Quote or Cite
This document is currently under review by US EPA and its federal, state and tribal partners, and is subject to change in whole or part

are no longer valid. The following are some of the specific LWG concerns with the new RAO text:

- EPA has removed all of the "additional consideration" language that EPA directed the LWG to use in a letter on September 30, 2009. As noted above, this additional language provides critical explanation for the interpretation of the RAOs and how they should be used in the FS. The most important additional consideration no longer explained in the draft revised Section 2 is that the RAOs require risk reduction at the site <u>through sediment remedies</u>, and that other sources of risk (e.g., upland and watershed sourced contaminants) also exist that the sediment remedy cannot directly address.
- EPA added language about "riverbank soils" to three of the RAOs and removed the definition of "site sediments." The definition of site sediments is important clarifying information regarding the subject of the remedy (i.e., contaminated sediments that reside below an elevation of 13.3 feet Mean Low Water North American Vertical Datum of 1988 [MLLW NAVD88]).[2] By removing this definition and including "riverbank soils," EPA has obscured which contaminated media the remedial alternatives are intended to address. As a result, it appears EPA is suggesting addressing riverbank soils above 13.3 feet MLLW NAVD88, which are not subject to the Administrative Settlement and Order on Consent (ASAOC) and were, for that reason, not investigated in the RI. The regulatory approach to riverbank soil cleanup and the variations in riverbank soil cleanup approaches that exist at various sites along the river need to be clarified and made consistent with the authority of the ASAOC and the existing February 2001 Memorandum of Understanding between EPA, DEQ and their partner agencies. EPA provided some oral explanation on March 17, 2015 for some of these changes and how EPA now intends to approach riverbank remediation in the revised FS alternatives. The LWG continues to disagree with these RAO changes based on EPA's recent oral explanations, and regardless, points out that the current draft revised FS Section 2 does not describe the river bank approach orally described by EPA on March 17, 2015.
- EPA changed the general format of the RAOs from language about "reducing risk to acceptable levels" (through sediment remedies as discussed previously) to language about

[2] This distinction has been fundamental to the entire RI/FS. The Administrative Settlement and Order on Consent provides that "RI/FS work for uplands facilities is being or will be conducted pursuant to separate agreements or orders issued by DEQ or EPA and is not covered by this Order which is for the in-water portion of the Site." The EPA/DEQ *Portland Harbor Joint Source Control Strategy*, December 2005, at page 2-2, explains, "Under the MOU, the DEQ was designated the lead for the identification and control of upland contaminant sources to the Portland Harbor Superfund Site. . . .The EPA was designated lead for investigating the nature and extent of in-water contamination... ."

"reducing COC concentrations" in riverbank soils, surface water, biota, and sediment. This change makes soil, surface water, biota, and sediment concentration reductions the explicit goals of the remedy. The LWG fundamentally disagrees that concentration reductions are the only, or even primary, way that the RAOs can or will be achieved. Consistent with a risk-based framework for sediment remedies (EPA 2005; p. 1-5), the RAOs should focus on reduction of risks to acceptable levels, where possible. Further, the LWG disagrees that PRGs in surface water, riverbank soil, and biota are the primary objective of the remedy. Previously, EPA had indicated in FS technical discussions, and the LWG agreed, that levels in surface water and biota would be considered "targets" (not PRGs), given that a sediment remedy alone may not be able to achieve acceptable levels in these media. EPA appears to have abandoned that approach with the new RAO language and directly links success of the sediment remedy to achieving specific concentrations in surface water and biota. Further, the RAOs imply that acceptable risk levels will be achieved using the sediment, water, and biota PRGs, but some of the PRGs are based on background values and still present unacceptable risk.

- Edits to groundwater RAOs specify that the groundwater PRGs are measured in porewater. In the draft revised Section 2, EPA defines porewater as water residing in the sediment biologically active zone (p. 2-10). This approach and definition of porewater is different than the definition of TZW, defined as the top 30 centimeters, which is used throughout the RI/FS. EPA previously required the field sampling and analysis for groundwater impacts in the RI/FS to focus on TZW, which may not relate directly to concentrations in biologically active zone porewater. These TZW values were used in the Baseline Ecological Risk Assessment (BERA) to estimate risks to ecological receptors in the biologically active zone, but given the differences between TZW and biologically active zone, the results of these risk estimates cannot be used to define COCs. Also, in human health RAO 4, EPA indicates that MCLs and AWQC are the PRGs as measured in porewater, but those criteria are not applicable to porewater, given the point of exposure to people will be in the surface water and, for drinking water, at point of use. Regardless, the LWG does not agree there should be any PRGs for groundwater at the site, for reasons discussed in our June 2014 comments.

14. Surface Water and Tissue PRGs

In addition to the changes in the RAO text, EPA changed surface water and tissue "target levels" in the August 2014 version of Table 2.2-1 to "PRGs." EPA is reversing past agreements that these media, particularly biota, should not be subject to remedial goals. The LWG has specifically previously commented that only sediment levels should be referred to as PRGs because other chemical sources impact water and tissue levels. Combined with the RAO language changes, the draft revised Section 2 now explicitly suggests that certain surface water and biota concentrations are remedial goals, and eventually cleanup levels, for the site.

15. Target Areas and Volumes for Remediation

EPA described in the March 17, 2015 meeting that EPA identified areas selected for "remediation" in Section 2.2.6 by mapping the lowest PRGs on a point-by-point basis and identifying the volume of remediation by apparently assuming 10 feet of removal over the entire study area. (It is noteworthy that the draft revised FS Section 2 text does not explain or refer to any place the reader can find an explanation of this remediation area mapping, or the volume determinations.) The areas mapped in Figure 2.2-2 are inconsistent with the risk assessments and represent a fundamental misapplication of the PRGs at inappropriate spatial scales. Also, the stated volume in no way relates to volumes of sediment that may pose risk or likely future risk.

16. Inconsistent Development of Fish/Shellfish Consumption PRGs

In Appendix B1 Section 1.2.1, EPA presents one PRG calculation for fish and shellfish consumption PRGs. Consumption rates are different for fish and shellfish, and EPA has indicated that a shellfish consumption rate was input to this calculation to develop the shellfish consumption sediment PRG for carcinogenic polycyclic aromatic hydrocarbons (cPAHs). (EPA has indicated that the cPAH sediment PRG is the only one based on shellfish consumption.) However, the tissue PRG EPA presents in Table 2.2-1 for cPAHs is based on fish tissue with a value of 0.05 µg/kg ww. Given that the sediment PRG for cPAHs is for clam consumption, the tissue PRG should also be based on shellfish consumption and should be changed to a value of 7 µg/kg ww. Also, aldrin is a COC only for shellfish consumption, so the aldrin tissue and sediment PRGs should be based on shellfish consumption, not fish consumption as EPA currently presents. EPA needs to provide clear sediment and tissue PRGs in PRG development for fish or shellfish consumption that do not confuse these two pathways.

Similarly, EPA's draft revised FS Section 2 indicates that "[r]isk-based PRGs protective of fish/shellfish consumption were not developed for arsenic, mercury, BEHP, and PDBEs because a relationship between tissue and sediment concentrations could not be determined." However, EPA presents other PRGs that have this same lack of relationship. For example, as noted above, EPA presents for cPAHs a sediment PRG based on clam consumption as a "surrogate" for fish consumption risk and a tissue PRG for fish tissue (instead of shellfish tissue). Site data indicate there is no relationship between levels of this COC in sediments and fish tissue, and EPA has orally agreed in FS technical meetings. Because the fish and shellfish consumption scenarios are completely different, the cPAH sediment PRG proposed by EPA does not address this lack of relationship between fish and sediment. EPA should be consistent in the determination of fish consumption PRGs across all chemicals.

Also, EPA should maintain consistency with other regional EPA cleanups. Specifically, the Lower Duwamish Waterway (LDW) Record of Decision (ROD; EPA 2014) concludes that development of a sediment cPAH PRG for the human health seafood consumption pathway was inappropriate because there is no observable relationship between cPAH sediment and tissue concentrations. The LDW ROD discusses the need for future investigations of the sediment/ tissue relationships for cPAHs (EPA 2014). Therefore, EPA defined the LDW sediment cleanup footprint based on other cleanup levels for PAHs (e.g., human direct contact with sediment).

17. Use of Bioaccumulation Water Criteria for Surface Water and Groundwater PRGs

EPA is using organism + water bioaccumulation criteria for human health surface water and groundwater PRGs (RAOs 3 and 4). EPA previously agreed in FS technical discussions that organism-only criteria should be used and shown under the bioaccumulation RAO (RAO 2) only. EPA further agreed that direct contact/water ingestion criteria should be used for surface water and groundwater PRGs, as shown in EPA's last version of the PRGs table (August 6, 2014). EPA has now reversed this decision and changed the surface water and groundwater PRGs for RAOs 3 and 4 back to organism+water values. EPA mentioned at the March 17, 2015 meeting that this change was made because PRGs should be media-specific not pathway specific. The LWG does not understand this explanation or how it is consistent with regulations and guidance or with how EPA assigned other PRGs to the various RAOs.

EPA's water PRGs are now often the same across RAOs 2, 3, and 4. However, confusingly, the values of the PRGs are sometimes different in RAOs 3 and 4 compared to RAO 2. For example, for cPAHs, a criterion of 0.0018 micrograms per liter (µg/L) is shown in RAO 2, but a criterion of 0.0013 µg/L is shown in RAOs 3 and 4 (see also DDx for a similar situation). EPA indicates in two different places that it is using organism-only criteria for RAO 2 and organism + water criteria for RAOs 3 and 4, but does not explain the reason for this difference and how it relates to differences of the RAOs.

Confusingly, EPA indicates the following in Section 2.2.2.1: "EPA regional screening levels (RSLs) for tap water (EPA 2014) were used as the risk-based PRGs for RAOs 3 and 4." But then it indicates in Section 2.2.3 that "[t]he PRGs for RAOs 3 and 4 were selected from the State of Oregon AWQCs (organism + water) and MCLs presented in Table 2.1-4." The various draft revised FS Section 2 tables show RSLs, Maximum Contaminant Levels (MCLs), and bioaccumulation Ambient Water Quality Criteria (AWQC), but the process for selection of any particular value for RAOs 3 and 4 is not clearly defined in the supporting tables or text.

Do Not Quote or Cite
This document is currently under review by US EPA and its federal, state and tribal partners, and is subject to change in whole or part

18. Potentially Unacceptable Risk

EPA refers in multiple locations to contaminants posing unacceptable risk (e.g., last sentence of the first paragraph of Section 2.2.1). This and any similar language should refer to potentially unacceptable risk. This is not an issue of semantics; contaminants with HQs greater than or equal to 1 were not identified as posing unacceptable risks in the BERA. Similarly, the BHHRA determined potentially unacceptable risks.

19. Benthic Toxicity Narrative PRG

EPA indicates in Table B-2 that EPA is comparing the bioassay responses to negative control. This is technically incorrect. The toxicity thresholds were derived and applied based on comparison to reference envelope values (positive controls), which should be the basis for any narrative PRGs.

20. General Response Action (GRA) Descriptions

Per Comment 11, the LWG recommends that the descriptions of the GRAs and the remedial technologies adhere more closely to guidance to avoid potentially biased descriptions of the GRAs and technologies. Often, the GRA descriptions used in Section 2.3 appear to emphasize the cons of less intrusive technologies and the pros of the more intrusive technologies.

21. In Situ Treatment Description

There is minimal description of the in situ treatment GRA. The text also indicates for this technology alone that site-specific pilot studies may be needed, although this technology has been well established in the last few years. The LWG's position is that in situ treatment does not require pilot studies to any greater degree than other technologies currently under consideration, particularly in comparison to ex situ treatment. For in situ treatment, the EPA guidance (EPA 2005) is significantly out of date, and new information consistent with more recent publications should be summarized here (see the draft FS Section 6 discussions for a starting point). Also, the text confuses elements of in situ treatment and enhanced MNR, which should be described as distinct technologies as in the guidance.

22. Dewatering Treatment Description

The wastewater treatment discussion in Section 2.4.3.3 makes assumptions about how dredge dewatering can be controlled and where it will be discharged (if at all) that are misleading and do not encompass the full range of technology options for dewatering. The text discusses wastewater treatment plants only, implying that this is the only way to manage dewatering. Many other approaches exist for handling and discharging dewater including, but not limited to, on-barge water treatment, addition of amendments to bind or absorb water, use of upland transfer

Do Not Quote or Cite
This document is currently under review by US EPA and its federal, state and tribal partners, and is subject to change in whole or part

or disposal holding areas to allow water to clarify before discharge, and discharge to publicly operated existing treatment facilities. Also, discharge mixing zones are commonly used on environmental dredging projects in combination with one or more of the above options, and this element of dewater discharge is not discussed at all.

23. Retained Disposal and Ex Situ Treatment Options

Section 2.4.5 implies that EPA has retained three disposal options (off-site landfill, "a RCRA disposal facility," and a Confined Disposal Facility [CDF]) for development of alternatives. However, based on FS technical discussions, the LWG's current understanding is that EPA intends to develop alternatives in Section 3 that only include off-site landfills. It is unclear how Section 2.4.5 is consistent with EPA's intentions for Section 3 and what it means for the alternatives eventually developed there.

Also, in Table 2.4-2, the Arkema CDF should be retained as a disposal option. EPA does not provide a supportable technical argument against the Arkema CDF. Further, it is not in the spirit of the Arkema Engineering Evaluation/Cost Analysis and the recent Albright opinion regarding the Legacy Site Services (LSS) data collection work plan to screen out the Arkema CDF at this time. The LSS work plan will develop the data required to fully evaluate a CDF and, therefore, the CDF cannot be reasonably screened out at this time in absence of the work plan information.

Also, for ex-situ treatment technologies, EPA retained soil washing, despite the fact that it was screened out in the 2012 draft FS consistent with early draft technology screening tables provided to EPA. This technology was also evaluated extensively at other sediment cleanup sites (including the LDW) and screened out due to the lack of demonstrated success. It is particularly ineffective when substantial fines are present in the sediments. EPA acknowledges in draft revised FS Section 2 that the site contains a large percentage of fines in many locations.

25. Application of CBRA

While the CBRA integrates multiple lines of evidence and defines areas that may be the subject of further evaluation, testing to rule out false positives is essential.

REFERENCES

DEQ, 2014. Portland Harbor Upland Source Control Summary Report. Prepared by Oregon Department of Environmental Quality, Northwest Region Office. November 21, 2015. Portland, Oregon.

EPA, 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. Interim Final. EPA/540/G-89/004. OSWER Directive 9355.3-01.
U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, DC.

EPA, 1991. Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions, p.3 (OSWER Directive 9355.0-30, April 22, 1991).

EPA, 2002. Transmittal of Policy Statement: “Role of Background in the CERCLA Cleanup Program.” From Michael B. Cook, Director of Office of Emergency and Remedial Response to Superfund National Policy Managers Regions 1-10. OSWER 9285.6-07P. May 1, 2002, Washington, D.C.

EPA, 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites. EPA 540-R-05-102. OSWER 9355.0-85. December 2005. Washington, D.C.

EPA, 2014. Record of Decision Lower Duwamish Waterway Superfund Site. EPA Region 10. November 2014. Seattle, Washington.

LWG Comments on Table 2.1-1. Chemical-Specific ARARs for Remedial Action at the Portland Harbor Superfund Site

Medium	Regulation/Citation	Criterion/Standard	Comments	LWG Comments
Protection of surface water	Clean Water Act, 33 USC 1313 and 1314. Most recent 304(a) list, as updated up to issuance of the ROD	Under Section 304(a), minimum criteria are developed for water quality programs established by states. Two kinds of water quality criteria are developed: one for protection of human health, and one for protection of aquatic life.	Relevant and appropriate for cleanup standards for surface water and contaminated groundwater discharging to surface water if more stringent than promulgated state criteria. Relevant and Appropriate to short-term impacts from dredging and capping if more stringent than promulgated state criteria. Relevant and Appropriate as criterion to apply to point source discharges used in implementing the remedy, if applicable.	With respect to the first sentence, this should be qualified as noted in the 2/10/10 letter from Lori Cora to Patricia Dost: "If the State's water quality criteria is promulgated after the most recent NRWQC for that contaminant is published, but adopted a criteria less stringent than the NRWQC due to water body-specific reasons, per Subsection 2(B)(i), EPA may determine that the NRWQC is not relevant and appropriate as long as the remedy will be protective using the State promulgated standard." With respect to the last sentence, the LWG disagrees that all federal water quality standards are "relevant and appropriate as criterion to apply to point source discharges used in implementing the remedy, if applicable." The federal ARAR applicable in this circumstance is Clean Water Act section 402, 33 USC 1342 per section 3.2.3 of *CERCLA Compliance with Other Laws Manual.*
Protection of potential drinking water sources	Safe Drinking Water Act, 42 USC 300f, 40 CFR Part 141, Subpart O, App. A. 40 CFR Part 143	Establishes Maximum Contaminant Level Goals (MCLGs) and Maximum Contaminant Levels (MCLs) to protect human health from contaminants in drinking water.	Relevant and Appropriate as cleanup standards for groundwater and surface water at Portland Harbor, which are potential drinking water sources.	The LWG recommends reverting to the original sentence: "Relevant and Appropriate as a performance standard for groundwater and surface water that are potential drinking water sources." We disagree that these are "cleanup standards." Instead they are performance standards to be applied at point of use to drinking water taken from groundwater or surface water, which is how the SDWA is applied. (Also, the placement of the comma changed the meaning of the original text.)
Measure of protectiveness of human health and the environment in all media	Oregon Environmental Cleanup Law ORS 465.315. Oregon Hazardous Substance Remedial Action Rules OAR 340- 122-0040(2)(a) and (c), 0115(2-6).	Sets standards for degree of cleanup required for hazardous substances. Establishes acceptable risk levels for human health at $1x10^{-6}$ for individual carcinogens, $1x10^{-5}$ for multiple carcinogens, and Hazard Index of 1 for noncarcinogens; and protection of ecological receptors at the individual level for threatened or endangered species and the population level for all others.	A risk-based numerical value that, when applied to site-specific conditions, will establish concentrations of hazardous substances that may remain or be managed on-site in a manner avoiding unacceptable risk.	
Protection of surface water	Water Pollution Control Act ORS 468B.048. Water Quality Standards OAR Part 340, Division 41	DEQ is authorized to administer and enforce CWA program in Oregon. DEQ rules designate beneficial uses for water bodies and narrative and numeric water quality criteria necessary to protect those uses. OAR 340-041-0340 designates and defines the beneficial uses that shall be protected in the Willamette Basin.	Oregon's numeric toxics water quality standards (Tables 30 and 40) are applicable requirements as cleanup standards for surface water to the extent they are more stringent than Clean Water Act 304(a) recommended criterion. All state water quality standards, including numeric, narrative, and designated uses, are applicable requirements for any discharges to surface water from point sources and activities that may result in discharges to waters of the state, such as dredge and fill, de-watering sediments, and other remedial activities. All state water quality standards are applicable to measuring controls on contaminated groundwater discharging to the Willamette River.	The LWG disagrees that Oregon's numeric toxics water quality standards are applicable requirements as cleanup standards. The first sentence should read "Oregon's numeric toxics water quality standards (Tables 30 and 40) are relevant and appropriate as cleanup standards for surface water to the extent they are more stringent than Clean Water Act 304(a) recommended criterion," subject to qualifier stated in 2/10/10 letter from Lori Cora to Patricia Dost. The LWG also disagrees with the accuracy of the last sentence and asks that it be deleted. State WQS are written to be applied to surface water, not groundwater.

Do Not Quote or Cite
This document is currently under review by US EPA and its federal, state and tribal partners, and is subject to change in whole or part

LWG Comments on Table 2.1.2. Action-Specific ARARs for Remedial Action at the Portland Harbor Superfund Site

Action	Regulation/Citation	Criterion/Standard	Comments	LWG Comments
Actions that discharge dredged or fill material into navigable waters	Clean Water Act, Section 404 and Section 404(b)(1) Guidelines, 33 USC 1344, 40 CFR Part 230	Regulates discharge of dredged and fill material into navigable waters of the United States.	Applicable to dredging, covering, capping, and designation and construction of in-water disposal sites and in-water filling activities in the Willamette River.	
Actions that discharge pollutants to waters of U.S.	Clean Water Act, Section 402, 33 USC 1342	Regulates discharges of pollutants from point sources to waters of the U.S., and requires compliance with the standards, limitations and regulations promulgated per Sections 301, 304, 306, 307, 308 of the CWA.	Relevant and Appropriate to remedial activities that result in a discharge of pollutants from point sources to the river if more stringent than state promulgated point source requirements.	
Actions that discharge pollutants to waters of U.S.	Clean Water Act, Section 401, 33 USC 1341, 40 CFR Section, 121.2(a)(3), (4) and (5)	Any federally authorized activity which may result in any discharge into navigable waters requires reasonable assurance that the action will comply with applicable provisions of sections 1311, 1312, 1313, 1316, and 1317 of the Clean Water Act.	Relevant and Appropriate to implementation of the remedial action that results in a discharge to the river if more stringent than state implementation regulations.	
Actions resulting in discharges to waters of the State of Oregon, including removal and fill activities	Water Pollution Control Act ORS 468B.048 Regulations Pertaining to NPDES Discharges OAR 340-041, 340-042	Effluent limitations and management practices for point-source discharges into waters of the state (otherwise subject to NPDES permit but for on-site permit exemption).	Applies state water quality standards and effluent limitations to point-source discharges to the Willamette River.	
Actions resulting in discharges to waters of the State of Oregon, including removal and fill activities	Certification of Compliance with Water Quality Requirements and Standards ORS 468b.035, OAR 340-041, 340-042, 340-048	Provides that federally-approved activities that may result in a discharge to waters of the State requires evaluation whether an activity may proceed and meet water quality standards with conditions, which if met, will ensure that water quality standards are met.	Applicable to implementation of the remedial action (e.g., dredging, capping, and construction of confined disposal facility) that may result in a discharge to waters of the State.	
Actions resulting in discharges to waters of the State of Oregon, including removal and fill activities	ORS 196.825(5) -Statutory requirement to require mitigation. Implementing rules: OAR 141-085-510, 141-085-680, 141-085 0685, 141-085-0690, 141-085-0710, 141-085-715.	Substantive requirements for mitigation for the reasonably expected adverse effects of removal or fill in a project development in waters of the state, including in designated Essential Indigenous Anadromous Salmonid Habitat.	Applicable to remedial action dredge and fill activities, capping, and riverbank remediation.	OAR 141-085-0765 should be included in column B.
Actions in federal navigation channels	River and Harbors Act, 33 USC 401 et seq. 33 CFR parts 320 to 323	Section 10 prohibits the unauthorized obstruction or alteration of any navigable water. Structures or work in, above, or under navigable waters are regulated under Section 10.	Applicable requirements for how remedial actions are taken or constructed in the navigation channel.	

Do Not Quote or Cite
This document is currently under review by US EPA and its federal, state and tribal partners, and is subject to change in whole or part

LWG Comments on Table 2.1.2. Action-Specific ARARs for Remedial Action at the Portland Harbor Superfund Site

Action	Regulation/Citation	Criterion/Standard	Comments	LWG Comments
Transportation of hazardous waste off-site	Resource Conservation and Recovery Act. 40 CFR 260, 261	Establishes identification standards and definitions for material exempt from the definition of a hazardous waste.	Applicable to characterizing contaminated media or hazardous wastes generated from the action and designated for off-site or upland disposal; potentially relevant and appropriate for use in identifying acceptance criteria for confined in-water disposal.	
Transportation of hazardous waste off-site	Resource Conservation and Recovery Act. 40 CFR 260, 262	Includes manifest, record-keeping, and other requirements applicable to generators of hazardous waste.	Applicable to remedial actions that involve the transport of hazardous materials (i.e., dredged material)	The comment should be revised as follows: "Applicable to remedial actions that involve the transport of hazardous waste (i.e., dredged material)."
Transportation of hazardous waste off-site	Resource Conservation and Recovery Act. 40 CFR 263	Sets forth standards for transporters of hazardous wastes, including receipt of an EPA identification number and manifesting requirements.	Relevant and appropriate for remedial actions that involve the transport of hazardous materials (i.e., dredged material).	The LWG is not sure why this one is "relevant and approprate" instead of "applicable." It should be revised to: "Applicable to remedial actions that involve the transport of hazardous waste (i.e., dredged material)."
Transportation of and storage and disposal of hazardous waste off-site	Resource Conservation and Recovery Act. 40 CFR 264 and 265	Management standards including record keeping, requirements for particular units such as tanks or containers, and other requirements applicable to owners and operators of hazardous waste treatment, storage and disposal facilities.	Relevant and appropriate to remedial actions that involve the off-site transport of hazardous materials for storage and/or disposal (i.e., dredged material).	The LWG is not sure why this one is "relevant and approprate" instead of "applicable." It should be revised to: "Applicable to remedial actions that involve the transport of hazardous waste (i.e., dredged material)."
Disposal of samples and remedial waste	Resource Conservation and Recovery Act. 40 CFR 268	Places land disposal restrictions, including treatment standards and related testing, tracking and record keeping requirements on hazardous waste.	Applicable for waste generated from remedial process and analyzed samples transported off site for disposal.	This regulation is applicable to hazardous wastes, not remediation waste. It should read "Applicable to hazardous waste transported offsite for disposal."
Upland and in-water disposal of dredge material	RCRA – Solid Waste. 40 CFR 257 Subpart A	Establishes criteria for determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or the environment.	RCRA Solid Waste requirements may be relevant and appropriate to remedial actions that result in upland or in-water disposal of dredged material. Requirements for the management of solid waste landfills may be relevant and appropriate to upland disposal.	
Transportation of hazardous waste off-site	Hazardous Materials Transportation Act. 49 USC §5101 et seq. 40 CFR Parts 171-177	Establishes requirements for acceptance and transportation of hazardous materials by private, common, or contract carriers by motor vehicle.	Hazardous Materials Transportation Act requirements are applicable to remedial actions that involve the transport of hazardous materials (i.e., dredged material).	
Onsite treatment, disposal, storage of hazardous waste	Hazardous Waste and Hazardous Materials II. ORS 466.005(7) OAR 340-102-0011 - Hazardous Waste Determination	Defines "Hazardous Waste" and the rule contains the criteria by which anyone generating residue must determine if that residue is a hazardous waste.	Specifies substantive requirements if remedial action will involve on-site treatment, disposal, or storage of RCRA-listed or characteristic hazardous waste. (Note: off-site treatment, storage, or disposal subject to all administrative and substantive state requirements.)	
Onsite treatment, disposal, storage of hazardous waste	Hazardous Waste and Hazardous Materials II. Identification and Listing of Hazardous Waste OAR 340-101-0033	Identifies additional residuals that are subject to regulation as hazardous waste under state law.	Specifies requirements if remedial action will involve on-site treatment, disposal, or storage of additional listed wastes.	
Onsite treatment, disposal, storage of non-hazardous waste	Solid Waste: General Provisions. ORS 459.005, OAR 340-093, 340-094	Substantive Requirements for the location, design, construction, operation, and closure of solid waste management facilities.	Applicable if upland disposal facility contemplated on-site for solid, nonhazardous, waste disposal, handling, treatment, or transfer. (Note: off-site transfer, treatment, handling, or disposal subject to all administrative and substantive state requirements.)	
Onsite treatment, disposal, storage of non-hazardous waste	Solid Waste: Land Disposal Sites Other than Municipal Solid Waste Landfills ORS 459.015, OAR 340-095	Requirements for the management of solid wastes at land disposal sites other than municipal solid waste landfills.	Applicable to the on-site management and disposal of contaminated sediment, soil, and/or groundwater.	

LWG Comments on Table 2.1.2. Action-Specific ARARs for Remedial Action at the Portland Harbor Superfund Site

Action	Regulation/Citation	Criterion/Standard	Comments	LWG Comments
Actions handling PCB remediation wastes and PCB containing material	Toxic Substances Control Act, 15 USC §2601 et seq., 40 CFR Part 761.60-761.79	Establishes requirements for handling, storage, and disposal of PCB-containing materials, including PCB remediation wastes, and sets performance standards for disposal technologies for materials/wastes with concentrations in excess of 50 mg/kg. Establishes decontamination standards for PCB contaminated debris.	TSCA requirements are applicable to the handling of contaminated material, debris, or surface water with PCB contamination.	
Risk-based limits protective of human health for air emissions associated with soil or sediment removal	Clean Air Act, 40 CFR Parts 50 and 52	Air emissions from stationary and mobile sources that may be generated that creates threats to human health as defined in the regulations.	Relevant and Appropriate to remedial activities that generate air emissions.	
Actions generating air emissions	Oregon Air Pollution Control ORS 468A et. seq., General Emissions Standards OAR 340-226	DEQ is authorized to administer and enforce Clean Air program in Oregon. Rules provide general emission standards for fugitive emissions of air contaminants and require highest and best practicable treatment or control of such emissions.	Applicable to remedial actions taking place in on-site uplands. Could apply to earth-moving equipment, dust from vehicle traffic, and mobile-source exhaust, among other things.	
Actions generating air emissions	Fugitive Emission Requirements OAR 340-208	Prohibits any handling, transporting, or storage of materials, or use of a road, or any equipment to be operated, without taking reasonable precautions to prevent particulate matter from becoming airborne. These rules for "special control areas" or other areas where fugitive emissions may cause nuisance and control measures are practicable.	Applicable to remedial actions taking place in on-site uplands. Could apply to earth-moving equipment, dust from vehicle traffic, and mobile-source exhaust, among other things.	
Actions that may affect fish and wildlife	Fish and Wildlife Coordination Act. 16 USC 662, 663 50 CFR 6.302(g)	Requires federal agencies to consider effects on fish and wildlife from projects that may alter a body of water and mitigate or compensate for project-related losses, which includes discharges of pollutants to water bodies.	Potentially applicable to determining impacts and appropriate mitigation, if necessary, for effects on fish and wildlife from filling activities or discharges from point sources.	
Presence of protected species	ODFW Fish Management Plans for the Willamette River. OAR 635, div 500	Provides basis for in-water work windows in the Willamette River.	Potentially applicable to timing of implementation of the remedial action due to presence of protected species at the site.	
Actions that may affect marine mammals	Marine Mammal Protection Act. 16 USC §1361 et seq. 50 CFR 216	Imposes restrictions on the taking, possession, transportation, selling, offering for sale, and importing of marine mammals.	Applicable to remedial actions that have the potential to affect marine mammals.	
Actions that may affect migratory birds	Migratory Bird Treaty Act. 16 USC §703 50 CFR §10.12	Makes it unlawful to take any migratory bird. "Take" is defined as pursuing, hunting, wounding, killing, capturing, trapping and collecting.	Applicable to remedial actions that have the potential to effect a taking of migratory birds.	

Do Not Quote or Cite
This document is currently under review by US EPA and its federal, state and tribal partners, and is subject to change in whole or part

LWG RESPONSES TO EPA'S RESPONSES TO LWG COMMENTS ON FEASIBILITY STUDY REVISED DRAFT SECTION 2 TEXT

This document contains the Lower Willamette Group's (LWG) responses to the U.S. Environmental Protection Agency's (EPA) April 10, 2015 responses to LWG's March 25, 2015 comments on EPA's February 23, 2015 draft revised Feasibility Study (FS) Section 2.

Generally, EPA's April 10, 2015 responses to the LWG comments disagreed with the majority of the LWG's comments and EPA proposed only a few resulting changes to FS Section 2. We believe that the LWG's position on the various Section 2 concerns is already clear in the LWG March 25, 2015 comments. In all cases where EPA disagreed with the LWG's comments, the LWG reiterates and continues to have the concerns stated previously in those comments. Consequently, these comments are not repeated in any LWG responses here. The following responses are confined to 1) instances where new positions or additional information were provided by EPA that the LWG wishes to state either disagreement or agreement with and 2) clarification questions regarding EPA's responses and 3) offers by the LWG to provide additional information to support EPA's ongoing revisions to the FS. For clarity, all previous comments and responses are repeated here, even if the LWG has no additional response. The original LWG comment is shown first, followed by EPA's response, and then LWG's response (if any).

1. Contaminants of Concern (COCs) and Preliminary Remediation Goals (PRGs)

COCs and PRGs should only be selected for those contaminants and exposure scenarios identified as being site-related and posing potentially unacceptable risk in the approved baseline human health and ecological risk assessments. Then, from among that list of PRGs, the FS should *focus* on PRGs for which acceptable risk levels can be achieved through a sediment-only cleanup. The June 2014 comments detail examples and specific issues related to the LWG's concerns on these points. Also, the June 2014 comments note regarding ARARs that EPA guidance states the following:

> "As a general policy and in order to operate a unified Superfund program, EPA generally uses the results of the baseline risk assessment to establish the basis for taking a remedial action using either Section 104 or 106 authority. If the baseline risk assessment and the comparison of exposure concentrations to chemical-specific standards indicates that there is no unacceptable risk to human health or the environment and that no remedial action is warranted, then the CERCLA Section 121 cleanup standards for selection of a Superfund remedy, including the requirement to meet applicable or relevant and appropriate requirements (ARARs), are not triggered" (EPA 1991).

While EPA has made a first step toward focusing the PRG list in its analysis in Table 2.1-2 "Summary of COC Selection Process," EPA has not fully not addressed this prior LWG comment and continues to include in Section 2 many non-risk-based PRGs and PRGs for media that do not clearly relate to site-related releases, exposure pathways posing risk, or to a sediment-only cleanup. For example, in Table 2.1-3, EPA notes numerous PRGs that were selected because they are "S – Known upland source not evaluated in the risk assessment" or "M – Media associated with exposure point risk." These chemicals were not necessarily found to pose risk in the media for which a PRG was designated, and therefore, should not have PRGs for these media for the sediment remedy.

EPA Response: Both the baseline human health risk and the baseline ecological risk assessments concluded that there is unacceptable risk at the site and therefore CERCLA action is warranted. Thus, ARARs are triggered. EPA will clarify the FS Section 2 text to identify COCs based on potential unacceptable risk or ARARs. In addition to contaminants identified as potentially unacceptable risk in the risk assessments, the potential for a contaminant to pose or contribute to unacceptable risk based on the conceptual site model is also a basis for including a contaminant as a COC and establishing a PRG, particularly where the contaminant is exceeding an ARAR. The PRGs have been established and the final remediation goals/cleanup levels will be developed considering the factors specified in 40 CFR 300.430(e)(2)(i). EPA has reviewed the COCs and PRGs and has revised the tables.

LWG Response: The LWG disagrees that because potentially unacceptable risk was found for some chemicals that chemical specific "ARARs are triggered" for other chemicals. For example, Oregon has water quality standards for over 100 chemicals. EPA did not trigger chemical-specific numeric values for most of those chemicals, and it would not make sense to do so because they were not found to pose potentially unacceptable risks at the site. Also, the LWG is unaware of any relevant guidance or NCP regulation that calls for the identification of COCs or PRGs based on the "conceptual site model." The LWG maintains that COCs and PRGs should only be considered for those chemicals found to pose potentially unacceptable risks in the baseline risk assessments.

2. Sediment Background Concentrations and Equilibrium Levels

Development and use of sediment background concentrations in the FS should be consistent with the conceptual site model for the Portland Harbor Superfund Site (Site) based on the data collected. In June 2014, the LWG provided an attachment to the comments describing the need for development of "equilibrium" levels for Portland Harbor that used other methods beyond EPA's directed statistical analyses of upstream sediment background data. EPA has not responded in writing to the LWG's proposal, although it has indicated orally that this concept would be considered for FS Section 4. The LWG continues to recommend that the equilibrium concept be factored into PRG selection because equilibrium levels represent reasonably achievable sediment concentrations for the harbor. EPA sediment remediation guidance is clear that Remedial Action Objectives (RAOs), PRGs, Remedial Goals (RGs), and eventual cleanup levels should represent values that are achievable by implementation of the sediment remedy alone (EPA 2005; p. 2-15).

EPA Response: EPA will conduct an equilibrium evaluation in Section 4 of the FS. The most appropriate means to evaluate whether RAOs or PRGs are achievable by any of the alternatives being developed in Section 3 of the FS is to conduct the detailed evaluation in Section 4 of the FS using the first seven NCP criteria. This information will be considered in developing the final remediation goals/cleanup levels.

LWG Response: No new response.

3. PRG Consistency with Risk Assessments and Risk Management Principles

Risk-based PRGs for evaluating cleanup alternatives should be consistent with the spatial scales of the exposure scenarios used to characterize risk in the approved baseline human health and ecological risk assessments. Risk-based PRGs should also be developed based on technically sound principles and application of risk management principles, as called for in EPA's regulation and guidance (see LWG's June 2014 comments for guidance quotes). Per these precepts, the LWG had requested that EPA greatly reduce the number of COCs and PRGs consistent with its practice at other sediment remediation sites. Instead EPA increased the number of COCs and PRGs since the last PRGs table was made available to the LWG.

For example, in Section 2.2.1, EPA indicates that "[c]ontaminants found to pose a lifetime cancer risk greater than 1×10^{-6} or hazard quotients (HQs) greater than 1 were identified as contaminants posing unacceptable risks." As a matter of risk management, this approach is the most conservative that EPA could apply. The National Contingency Plan (NCP) incorporates a flexible threshold for EPA's determination of risk acceptability. Risks greater than $1x10^{-4}$ generally require remediation, risks less than $1x10^{-6}$ are generally considered acceptable, and risks between these values may or may not require action depending on site-specific circumstances. (Further, as discussed more below, this text should be changed to "posing potentially unacceptable risks" [emphasis added] in order to be consistent with the risk assessments.) Also, EPA notes in Section 2.2.2.1, "The [risk-based PRGs] were developed for COCs in sediment and biota tissue, assuming target cancer risk levels of 10^{-6} and 10^{-4}, and a target non-cancer Hazard Quotient of 1, for each of the receptors evaluated in the BHHRA and using the methodology described in Appendix B1." However, the human health PRG Tables 2.2-4 through 2.2-7 do not show any PRGs based on a cancer risk level of 10^{-4}. These PRGs are only presented in the appendices and should be moved forward into the main text tables.

In 2012, EPA Headquarters asked the LWG to obtain additional Small Mouth Bass (SMB) fish tissue samples from the site and from upstream areas that overlap with background sediment sampling locations. The LWG obtained and analyzed these samples. When the human health risk associated with the consumption of resident fish (SMB) from the upstream samples is calculated, cancer risk levels are present in the range of 10^{-5} and Hazard Quotients that in some cases exceed 50. Accordingly, regardless as to the methods used to calculate sediment background concentrations, these data demonstrate that health risk associated with the consumption of resident fish (SMB) from background areas exceed the higher-end criteria of acceptability (greater than 10^{-6} in the case of cancer risk and Hazard Quotients greater than 1 in the case of non-cancer risks). Based on the 2012 fish tissue data, at least 5 miles of the site extending from River Mile (RM) 4 through RM 8 are already within the risk range associated with consumption of the upstream fish. EPA's policy concerning background risk is straightforward:

> "Generally, under CERCLA, cleanup levels are not set at concentrations below natural background levels. Similarly, for anthropogenic contaminant concentrations, the CERCLA program normally does not set cleanup levels below anthropogenic background concentrations" (EPA 2002).

It is essential that Region 10 base its cleanup levels on the actual background conditions and risks as evidenced in both the 2002 and 2012 Upstream Fish Tissue Data.

Also, it appears that EPA is still calculating and applying many PRGs on spatial and temporal scales that are inappropriate based on the exposure assessment in the BLRAs or on the legal application of potential Applicable or Relevant and Appropriate Requirements (ARARs). For example, EPA presents Figure 2.2-2 entitled "Comparison of Risk Areas to be Remediated," which appears to define "remediation areas" based on a point-by-point (in both time and space) application of all PRGs developed by EPA. Also, in Section 2.2.2.2, EPA indicates that "[t]he lowest value for each media was selected as the risk-based PRG for RAOs 5 and 6 to be protective of all potential receptors." However, the PRGs for different ecological receptors are applied on different spatial scales, so applying the lowest PRG to individual locations throughout the harbor is inconsistent with how BLRAs were conducted.

To the extent that PRGs in Table 2.2-1 "Summary of Portland Harbor PRGs by RAO and Media" are based on potential Oregon ARARs, they need to be applied in the manner those potential ARARs would be applied under Oregon law. *See LWG, Background Document: Application of Oregon Water Quality Standards, Tab 7 (provided to EPA July 7, 2008).* For example, cadmium was identified as a COPC in the BERA, and its PRG in Table 2.2-1 for RAO 7 (aquatic direct contact/ingestion) is set by reference to Oregon toxics criteria for aquatic protection, OAR 340-041-0033, Table 30. With respect to the temporal application of these criteria, Table 30 notes that these Oregon criteria are not to be applied based on single grab samples. Rather, they are applied “as a 96-hour (4 days) average concentration [which] should not be exceeded more than once every three years.” With respect to the spatial scale of application, these criteria would not be applied on a point-by-point basis, but rather would include application of the implementation provisions of Oregon’s water quality standards including, for example, use of regulatory mixing zones. *Id., Tab 7 at 8-9 and Tab 8*. Finally, EPA’s Table 2.2-1 also appears to apply toxics criteria from OAR 340-041-0033, Table 30, to porewater, which is an application that would not be made under Oregon law.

Also, EPA indicates in Section 2.2.2.1, “The risk-based PRGs for RAOs 1 and 2 represent the lowest value in each media (beach or in-water sediment, and fish/shellfish tissue) to be protective of all potential receptors.” However, this direct comparison is inappropriate because these PRGs should not be applied the same way if the comparison is to be consistent with the BHHRA. The lowest value selected across all scenarios may not be appropriate to apply in certain areas or over certain spatial scales. For example, recreational beach user PRGs only apply to recreational beaches, and fish consumption PRGs are for subsistence fishers only (which is generally a site-wide exposure). Showing the lowest value by media loses the context for how the PRGs should be applied.

Similarly, EPA indicates in Section 2.2.2.1, “EPA regional screening levels (RSLs) for tap water (EPA 2014) were used as the risk-based PRGs for RAOs 3 and 4.” However, only a few chemicals were found to pose potentially unacceptable risk in the BHHRA for the scenarios addressed by RAO 3, and no chemicals were found to pose potentially unacceptable risk for scenarios addressed by RAO 4. Consequently, risk-based levels are not necessary or appropriate for most of the chemicals listed by EPA for RAO 3, nor are risk-based levels necessary for RAO 4. (And for reasons noted in the LWG’s June 2014 comments, the LWG disagrees that PRGs are needed for the groundwater RAOs at all.)

These are just a few examples of EPA performing evaluations that ignore reasonable risk management approaches or are inconsistent with the BLRAs or with the basis for the potential ARARs which EPA appears to be applying, which severs the link to a risk-based cleanup as clearly called for in the guidance (EPA 2005; p. 1-5).

EPA Response: The EPA’s Contaminated Sediment Guidance Highlight 1-4 (USEPA 2005) provides Risk Management Principles Recommended for Contaminated Sediment Sites as follows:

1 - Control sources early. 2 - Involve the community early and often. 3 - Coordinate with states,

local governments, Indian tribes, and natural resource trustees. 4 - Develop and refine a conceptual site model that considers sediment stability. 5 - Use an iterative approach in a risk based framework. 6 - Carefully evaluate the assumptions and uncertainties associated with site characterization data and site models. 7 - Select site-specific, project-specific, and sediment specific risk management approaches that will achieve risk-based goals. 8 - Ensure that sediment cleanup levels are clearly tied to risk management goals. 9 - Maximize the effectiveness of institutional controls and recognize their limitations. 10 - Design remedies to minimize short term risks while achieving long-term protection. 11 - Monitor during and after sediment remediation to assess and document remedy effectiveness.

The EPA's Contaminated Sediment Guidance, Chapter 7, provides guidance for risk management in remedy selection. This process includes weighing the trade-offs of the balancing criteria of the NCP. It also provides the basis for selecting RGs based on background. The FS provides the fundamental science to support risk management decisions. EPA is following its guidance in conducting an FS that strictly follows the scientific principles in its guidance.

<u>Scales for evaluation of PRGs</u>:

Given that receptors can be found anywhere in the river and most move around the river, the PRGs are selected to be applied site-wide, not for specific areas of the river to be protective of human health and the environment. The PRGs are selected to achieve each RAO. The spatial scales are established for the RAO, not for the individual species. The RAO is meant to protect all receptors covered by that RAO.

The human health baseline risk assessment determined that there were contaminants posing risk at the site outside of EPA's cancer risk range and noncancer hazard quotient. Therefore, PRGs for cancer risks to humans are set at the 10-6 level consistent with the NCP, which states that a risk of 10-6 represents the point of departure for determining remediation goals for alternatives. EPA has further clarified that the 10-6 level is the point of departure and the 10-4 level is for information purposes in Appendix B1. As a starting point, the most conservative PRG is selected; however, the evaluation in the FS will determine if these numbers are achievable by the alternatives. Only through the appropriate FS analysis can these numbers be further refined so that the rationale is scientifically justified and consistent with CERCLA, the NCP, EPA guidance and policy.

Also, as EPA has stated in many meetings with the LWG, the alternatives will be evaluated on many spatial scales to assess protectiveness and effectiveness. EPA shared those spatial scales with the LWG in July 2014. The map presented in Figure 2.2-2 is merely to show where sediment concentrations exceed the initial PRGs selected for the RAOs, and thus represent areas that will be further evaluated in the FS. These areas will be evaluated for all General Response Actions (GRAs), including institutional controls, containment in place, in-situ treatment, removal, confinement/disposal and monitored natural recovery. The alternatives are being developed in section 3 of the FS present a range of alternatives that each one includes a combination of all the GRAs, except the no action alternative. EPA is using site-specific environmental and physical conditions to assign the preferred GRA to various areas of the site. The vast range of environmental and physical conditions throughout the site does not allow for a single GRA to be used throughout the entire study area.

2012 Fish Data:

The upstream smallmouth bass collected by the LWG in 2012 were analyzed for PCBs in whole body of nine fish collected between RM 15 and RM 17. In 2002, six smallmouth bass were collected, three from RM 21 to RM 24, and three from above Multnomah Falls. These six fish were analyzed for multiple contaminants. As previously discussed with the LWG, EPA's review of the data concludes that at only RM 5W are PCB concentrations in smallmouth bass within the same range as those measured in the upstream data.

EPA will consider these data at the appropriate point in the FS process. EPA is not convinced that a sufficiently robust data set exists to compute a background concentration in fish tissue. EPA plans to use the LWG's FWM to determine what the tissue concentrations are expected to be based on the resulting post remediation sediment concentrations from the evaluations of each remedial action alternative. The outcome of the FS evaluation and using risk management, EPA will determine the final remediation goals/cleanup levels to present in the proposed plan.

Oregon Water Quality Standards:

EPA is basing its evaluation on the water data collected by the LWG for the RI/FS. Evaluation of the water data shows trends in the site that point to areas needing sediment remediation. When the data is averaged across the site, as was done by the LWG, it is difficult to discern the appropriate areas to take remedial action. Site-wide averaging is not consistent with how water quality standards are applied. The LWG's comment that PRGs based on Oregon's water quality standards should be applied like the state would apply them does not affect the decision identifying the standards as ARARs and PRGs. The final ARARs and final remediation goals/cleanup levels are identified in the ROD. Sampling and long-term monitoring to confirm achievement of RAOs will be determined during design and implementation of the remedy.

With respect to the specific comment regarding mixing zones, mixing zones have no application to uncontrolled releases of hazardous substances and other circumstances currently existing at the site.

Pore water is very closely associated with surface water, and the Oregon AWQCs are meant to protect aquatic life that reside in or on sediments and are exposed to sediment pore water as well as all biota that live in the surface water.

Use of Regional Screening Levels:

EPA establishes cleanup levels for contaminants that have the potential to pose unacceptable risk based on measured concentrations in the groundwater plumes or are present at concentrations greater than ARARs. EPA is using RSLs for contaminants in surface water or groundwater that do not have an MCL or MCLG. The RSLs are risk-based and set at either a cancer risk of 10-6 or an HQ equal to 1.

LWG Response: EPA states that it is following the "Risk Management Principles Recommended for Contaminated Sediment Sites." However, the response does not explain how EPA expects to incorporate these principles into the revised FS.

EPA alternatively states that 1) "Given that receptors can be found anywhere in the river and most move around the river, the PRGs are selected to be applied site-wide, not for specific areas of the river to be protective of human health and the environment" and 2) "the alternatives will be evaluated on many spatial scales to assess protectiveness and effectiveness." The LWG assumes that the second statement means that alternatives will be evaluated using PRGs, in which case we request clarification regarding how both of these approaches are technically consistent.

Regarding the fish tissue data, the LWG maintains that 2012 within-Site tissue data PCB concentrations are within the same range as those measured in upstream data for more Site areas than just at RM 5W including RMs 5 to 8.

Regarding surface water data, EPA indicates that LWG averaged the surface water data across the Site, which, EPA contends, obscures the need for sediment remediation in some areas. To clarify, the LWG conducted the risk assessments using surface water data and methods directed by EPA, and those EPA-approved risk assessments constitute the findings of potentially unacceptable risks for the Site. The LWG did not just average the data across the site, but also made comparisons based on the specific spatial scales directed by EPA.

The LWG maintains that COCs and PRGs should only be considered for those chemicals posing potentially unacceptable risk in the risk assessments, and should not be based on additional new data assessment procedures not included in the risk assessments.

Also, EPA notes that applying Oregon water quality standards consistent with temporal and spatial scales included in those standards does not affect EPA's decision identifying the standards as ARARs and PRGs. To determine whether any potential ARAR should be identified as a PRG, EPA should assess site data using temporal and spatial scales as close as possible to those under which that ARAR would be applied. Regardless, the LWG maintains that COCs and PRGs should only be considered for those chemicals found to pose potentially unacceptable risk in the risk assessments.

Finally, per the LWG's Comment 22, the use of mixing zones was mentioned as an action-specific ARAR (i.e., used during dredge or CDF discharge operations as part of remediation construction).

4. Background Values for Surface Water and Transition Zone Water (TZW)

EPA should develop background values for surface water using available upstream surface water data and develop background values for TZW using the considerable body of research literature from other sites regarding the concentrations of contaminants in non-CERCLA or non-contaminated sites. Currently, EPA's draft revised FS Section 2 presents many surface water and TZW (which EPA referred to as "porewater") PRGs that are well below likely ambient surface water (e.g., upstream river water) and TZW levels; therefore, these PRGs are unachievable, which is inconsistent with guidance. Specifically, EPA guidance (2005: p. 2-15) indicates that RAOs should be achievable by the site cleanup itself. PRGs are the numeric expression of the RAOs as EPA describes in revised FS Section 2.2.

EPA Response: Regarding background surface water concentrations, the LWG only collected 3.5 data points from the upriver reach at RM 16. This is insufficient data to compute robust and defensible background concentrations for contaminants in surface water. However, the data that was collected will be used in conjunction with the background sediment and upriver sediment traps to evaluate the ability of each of the remedial action alternative to achieve PRGs.

Transition zone water is not a media is by definition representative of the flux between surface water and groundwater. Thus, contaminant concentrations are dependent on specific local environmental conditions, and EPA does not consider it appropriate to calculate background concentrations.

LWG Response: The LWG agrees that surface water data should be used in conjunction with background sediment and upriver sediment traps to evaluate the ability of each alternative to achieve PRGs. We look forward to reviewing this analysis in Section 4 of the revised FS.

Regarding background for TZW, EPA indicates TZW is not a media and therefore, EPA does not consider it appropriate to calculate background for TZW. However, EPA proposes PRGs for groundwater that EPA will apply to porewater, per Section 2 text. In EPA's response to Comment 13, EPA also indicates that porewater is not an environmental media. If a PRG is developed for a media (or any type of matrix) then EPA's guidance to not generally set those PRGs below background should be followed.

5. Background Values for Dioxin/Furan (D/F) Sediment PRGs

Ultimately, the remediation goals should consider the risk-based PRGs and background. The LWG requested that EPA compare the D/F sediment PRGs to background and, as required, adjust the PRGs to background. EPA subsequently indicated in FS technical meetings that EPA considered the background dataset to have too many non-detects to calculate valid background values. EPA established detection-limit-based PRGs instead for some D/F congeners. The LWG understands that there is a relatively high level of non-detects in the background dataset; however, valuable information is contained within that dataset regarding detectable levels of D/Fs found upstream of the Site that clearly relates to achievable levels within the Site. If this dataset is used consistent with the equilibrium concept discussed previously, some of the rigid statistical requirements EPA is concerned about could be addressed through other means to provide an understanding of background conditions. At a minimum, understanding the range of background concentrations and the potential for upstream contributions is critical to evaluating remedy feasibility and effectiveness. Basing D/F PRGs on extremely low risk-based or detection limit values that may be below the range of background conditions continues to overlook the guidance requirement for achievable RAOs (EPA 2005; p. 2-15) and PRGs (which are the numeric expression of RAOs), and will very likely result in the establishment of remedial levels that are unattainable.

EPA Response: Background sediment concentrations for dioxin/furans will be calculated in a manner consistent with Mr. Albright's background dispute decision. Based on that information, EPA will adjust the PRGs to reflect the "background" levels for dioxin/furans and the other contaminants. EPA notes that the background dataset for dioxin/furans shows that they are infrequently detected, and in the case of some, such as 2,3,7,8-TCDD, were not detected at all in upstream samples.

LWG Response: The LWG agrees that dioxin/furan background sediment concentrations should be calculated. However, we do not agree that the method described in the Albright background dispute decision is scientifically valid or appropriate. When will the LWG have an opportunity to review and comment on these new background levels and the resulting adjusted PRGs?

6. Evaluate Remedial Alternatives with PRGs Applied on Appropriate Spatial Scales

The LWG requested that EPA evaluate remedial alternatives using risk-based PRGs applying the same spatial scales as the risk calculations in the risk assessments. EPA has indicated that this issue will be addressed in FS Section 4. Given that EPA's draft revised Section 2 already has examples of misapplication of the PRGs (see Comment 3), the LWG urges EPA to begin discussions on this issue now in order to ensure an adequate foundation for the significant technical evaluations necessary to adequately evaluate appropriate spatial scales in Sections 3 and 4.

EPA Response: Refer to EPA response to LWG comment #3.

LWG Response: No new response.

7. Include the Site Use Factor in Calculation of Sediment Direct Contact PRGs

The LWG requested that EPA include the site use factor in the calculation of the sediment direct contact PRGs for fisher scenarios used by EPA to develop PRGs under RAO 1, consistent with the BHHRA. EPA continues to exclude the site use factor in the PRG calculation, which is inconsistent with the EPA-approved BHHRA. The oral justification for excluding the site use factor that EPA provided in FS technical discussions was that the in-water sediment PRGs would not necessarily be protective of the fisher scenarios if the site use factor was included. It is unclear to the LWG how the BHHRA risks can be calculated correctly with inclusion of the site use factor for this scenario, while a PRG back-calculated in the identical manner would somehow not be protective for this scenario.

EPA Response: Application of a site-use factor for beaches results in a PRG that is 4 times greater than would be calculated for individual beaches when exposure is averaged across all possible exposure areas. Neither the LWG nor EPA has information that show that potential receptors visit all possible beaches in an equally portioned manner.

LWG Response: EPA's response does not address why it could be appropriate to calculate the risks using the assumptions directed by EPA for the risk assessments, but then not use those same assumptions for PRG development. EPA's response implies that the risk assessment methods potentially underestimate the exposure in this scenario, and the LWG disagrees with this implication.

8. Calculation of D/F PRGs in Sediment

The LWG proposed some general methods for calculating D/F risk-based PRGs in the June 2014 comments. EPA moved ahead with a D/F PRG development approach, which is described in a

CDM Smith working draft memorandum dated December 23, 2014. The LWG disagrees with the PRG methods described in this memorandum for numerous reasons, which can be fully described if necessary. In summary, some key reasons for our disagreement include:

- The models that EPA used to develop PRGs are initial calibrations that have not yet been checked and adjusted for consistency in parameterization across calibrated congener models.
- In selecting congeners for PRG development EPA ignored two of the three congener selection considerations that the LWG developed collaboratively with EPA in 2009.
- EPA failed to recognize clear spatial patterns of congener concentrations in smallmouth bass tissue. It developed a PRG methodology on the false assumption that such patterns did not exist.
- EPA correctly noted the lack of correlations between sediment and tissue congener concentrations, yet applied a PRG approach that depends on the assumption that sediment congener SWACs and tissue congener concentrations are correlated.

EPA Response: The model used by EPA to develop PRGs is the LWG's calibrated FWM with the congener specific input values provided by the LWG on August 22, 2014. The comment is not clear which of the two congener selection considerations the LWG is referring.

As EPA explained in an email to the LWG on August 15, 2014, EPA first looked at the spatial patterns in the smallmouth bass tissue to discern the congener patterns and select the specific congeners for further evaluation. EPA noted that the specific congener concentrations in sediment did not correlate to the specific congener concentrations in tissue. This is because individual congeners bioaccumulate at different rates. It is precisely for this reason that EPA determined it was most appropriate to calculate PRGs for individual congeners instead of total dioxins/furans or dioxin/furan TEQ. If the LWG is asserting that there is a lack of correlation between sediment and tissue congener concentrations, EPA is unclear why the LWG provided calibrated FWMs on August 22, 2014, for each of these five congeners for EPA to use in developing these PRGs.

LWG Response: Based on the response and April 10, 2015 discussions with EPA, the LWG wishes to clarify the first bullet in the LWG's comment. The LWG agrees with the validity of the bioaccumulation model for use in calculating PRGs for the project (i.e., LWG is not challenging the accuracy of the model). Also, the LWG is not asserting that there is a lack of correlation between sediment and tissue congener concentrations. The LWG's position is that there is some correlation; time will tell if the magnitude of the correlation (as the amount of explained variance) is adequate to develop PRGs.

9. Benzo(a)Pyrene Equivalent (BaPEq) PRG for Shellfish Consumption

The LWG requested that EPA express the BaPEq PRG based on human health clam consumption (RAO 2) on an organic carbon normalized basis, similar to the Focused PRGs EPA provided for the draft FS. The LWG also requested that EPA not use the clam consumption PRG as a "surrogate" for vertebrate fish consumption because it is not in any way applicable to a fish consumption scenario. EPA has neither revised the PRGs to address this comment nor explained the technical basis for its approach.

EPA Response: EPA calculated a PRG for cPAHs to address unacceptable risks associated with consumption of shellfish, and we anticipate that this PRG will also address the unacceptable risks identified in the BHHRA associated with consumption of fish. While EPA developed the PRG based on normalization of organic carbon and lipid content, the PRG was converted to a dry weight concentration consistent with the other PRGs.

LWG Response: EPA anticipates that the cPAH human health shellfish consumption PRG will address unacceptable risks for human health fish consumption (i.e., vertebrate fish). The LWG is requesting clarification on why EPA anticipates this to be true given that the two consumption scenarios assume different consumption rates and exposure locations (shoreline clamming areas versus the entire site) and there is insufficient relationship between fish tissue and sediment cPAHs data to calculate a valid fish consumption PRG. The LWG maintains that there is no way to determine whether the clam consumption PRG would be protective of fish consumption risks or not (i.e., application of the shellfish consumption PRG to a fish consumption scenario is arbitrary).

10. Benthic Risk PRGs Should Be Based on the Comprehensive Benthic Risk Area (CBRA) Approach

The LWG requested that, instead of using individual chemical sediment benthic PRGs for RAO 5, EPA develop a PRG that is based on the CBRA approach, to which EPA previously agreed. Specifically, EPA's letter on February 25, 2011 states, "All significant issues regarding use of the LRM and EPA's comments were resolved in principle as of December 13, 2010. The benthic approach agreed to is documented in Attachment B to LWG's January 12, 2011 letter. EPA is in general agreement with the approach as described in Attachment B to the LWG's letter with some clarifications that are provided as an enclosure to this letter." In addition, EPA approved the Final BERA, which concludes that "[p]otentially unacceptable benthic risks are highly associated with shoreline areas, slips, and areas of elevated chemical concentrations and represent approximately 7% of the total Study Area." EPA's approach of using individual SQVs as benthic PRGs will result in identification of potentially unacceptable benthic risk in the revised FS that is completely inconsistent with the EPA-approved findings in the BERA. In the June 2014 comments, the LWG made a specific recommendation regarding methods to derive PRGs consistent with the CBRA, but EPA did not make any related changes to its benthic PRG methods.

DEQ indicated in the March 17, 2015 meeting with EPA and LWG on Section 2 that there should be consistency between the RAO 5 PRGs and the CBRA (or alternatively to a benthic risk approach that the parties finally agreed to). The LWG agrees with DEQ that there needs to be consistency between the RAO 5 PRGs and the CBRA. It is confusing and inconsistent for EPA to define Sediment Management Areas (SMAs) using the CBRAs (which is presumably still EPA's intent), and then present an entirely different and technically inappropriate method for deriving benthic risk PRGs.

EPA's draft revised Section 2 further highlights the LWG's ongoing concern, given that EPA appears to have used individual benthic PRGs in Figure 2.2-2 to identify apparent ecological risk areas that are completely inconsistent with the agreed to CBRAs. Benthic risk PRGs are used in the development of this figure, which suggests that benthic risk exists over much greater than 7% of the total Study Area as concluded in the EPA-approved BERA. EPA indicated in the March 17, 2015 meeting on Section 2 that EPA intends the PRGs under RAO 5 to be surrogates for all ecological sediment direct contact risks. However, the vast majority of the RAO 5 PRGs are based on benthic risk endpoints and do not provide any direct indication of potentially unacceptable risks for other ecological receptors.

EPA Response: EPA is eliminating the PRGs based on the LRM from Table B-2 and is not considering them in the development of the numeric PRGs. EPA is also not using the CBRA approach to develop numeric PRGs. The CBRA approach looks at risk from concurrent exposure to multiple contaminants rather than on an individual contaminant basis. In conducting the evaluation of effectiveness and protectiveness on a contaminant-specific basis, EPA is going to use the values selected for the PRGs. Those values for RAO 5 will be evaluated on the SDU scale and on the rolling 0.5 mile by side of river scale, rather than on a point-by-point scale. This has all been fully discussed with the LWG during several meetings during 2014.

LWG Response: To comment further, the LWG would need clarification from EPA on why the CBRA approach of examining concurrent exposure from multiple contaminants is a negative attribute for PRG development in EPA's opinion. PEC quotients and similar benthic toxicity quotient approaches have been used successfully for many years at other sediment sites from initial assessment through FS and even construction phases. For example, a PEC quotient has been used for years at Onondaga Lake including in the FS, remedial design, and during

Do Not Quote or Cite
This document is currently under review by US EPA and its federal, state and tribal partners, and is subject to change in whole or part

construction of the remedial action. The LWG disagrees that evaluation of, for example, 20 chemicals separately using individual PRGs is any more technically accurate or logistically easier than evaluating those same 20 chemicals via a mean quotient or similar combined metric.

11. Technology Criteria, Scoring, and Technology Assignments

The LWG requested in 2014 that EPA discuss with the LWG the issues of technology criteria, selection scoring, technology assignment, and, in particular, the evaluation of monitored natural recovery (MNR), which was not discussed in any of the 2014 FS technical meetings. EPA proceeded with development of a draft technology screening subsection within Section 2. The LWG views much of the draft technology screening discussion in the draft revised FS Section 2 as a biased and selective description of the pros and cons of many of the technologies. Additionally, the screening discussion lacks necessary site-specific information and analysis. EPA guidance states that the technology screening process step is site specific and should be based upon information from the RI site characterization (EPA 1988: p. 4 – 16).

The LWG recommends that EPA employ an approach to describing the pros and cons of each technology similar to EPA's recent Community Advisory Group (CAG) presentation on MNR, which included pros and cons side by side using text from EPA's sediment remediation guidance. The LWG recommends that a similar approach for general technology screening be used in Section 2, and this should replace much of the relatively subjective text currently presented by EPA for these technologies. Because such pros and cons would be directly from guidance, this would ensure LWG and EPA agreement with the general evaluations of each technology in Section 2. The one exception to using the 2005 guidance is for in situ treatment, where the guidance is outdated (see Comment 22).

EPA Response: Much of the information provided in the screening tables was provided to the LWG in 2011 and is provided in the LWG's draft FS. EPA did a site-specific screening of the technologies. EPA is not scoring the technologies. EPA is unclear what the LWG's issues are regarding MNR, it is retained as a technology/remedial component of to be considered in developing alternatives. It is also not clear how citing general pros and cons contained in guidance for a particular GRA provides a site-specific analysis. In Section 3 of the FS, the specific areas identified for MNR will be developed for each remedial action alternative. This is conducted using the technology screening EPA presented to the LWG in July 2014.

LWG Response: The LWG clarified in our April 10, 2015 meeting that using the pros and cons in the guidance would allow a general description of each GRA in an unbiased manner that the LWG could quickly agree to. We agree that these general pros and cons would not be applicable to any site-specific screening of each technology. However, the LWG maintains that some elements of the screening discussion also appear biased in certain respects.

ADDITIONAL OR NEW MAJOR ISSUES

The following subsection presents additional major issues that the LWG has identified now that a draft of the revised Section 2 is available for review. Some of these issues are related to the previous comments summarized above, but the following comments discuss some new aspects of the LWG's concern based on EPA's draft revised Section 2.

12. Additional PRG Changes

EPA made numerous new changes to the PRGs tables since the last version provided by EPA to the LWG on August 6, 2014. At that time, EPA noted that the PRGs were still under evaluation and subject to change. However, given that the PRGs table for the revised FS had been under development by EPA since November 2013 (when EPA first presented a version of the PRGs for the revised FS), and EPA provided and discussed with the LWG multiple iterations of the PRGs, the LWG had a reasonable expectation that any additional changes to the PRGs would be relatively minor. Instead, EPA's draft revised Section 2 Table 2.2-1 contains 196 numeric PRGs, with 80 of the values presented being different from those presented in the draft table on August 6, 2014. Also, as noted above, the number of COCs and PRGs has increased since the last PRGs table, indicating that EPA is not using risk management principles as is commonly done at other sediment cleanup sites.

Conversely, many of the specific changes recommended by LWG have not been adopted. A particularly problematic (but not the only) example is that EPA made no changes to the manganese water PRG for RAO 8. The LWG submitted a very detailed technical analysis on August 1, 2014, indicating needed changes to this PRG, which EPA indicated it was willing to consider. EPA indicated at the March 17, 2015 meeting that EPA intended to change this PRG and not doing so was an oversight. The LWG recently re-submitted to EPA our specific request regarding changes to this PRG.

In general, the LWG requests that it be provided the rationale and calculations that were used to develop the revised PRGs for existing PRGs that were altered in the table.

EPA Response: The term "relatively minor changes" is subjective, and since as noted in its comment the LWG was aware that PRGs were still under development and subject to change, it is not clear why the LWG did not anticipate additional revisions to the PRGs. As indicated in the March 17, 2015 meeting, EPA intends to revise the manganese PRG for RAO 8. The LWG has already requested the PRG be revised, and now has done so again. That PRG will be revised in the subsequent revisions to FS section 2. Further, EPA is including the LWG's memo for developing the manganese surface water PRG as an Attachment to Appendix B2. The rationale and calculations for PRGs are provided in Sections 2.2.2.1 and 2.2.2.1, and Appendices B1 and B2.

LWG Response: The LWG looks forward to seeing the revised manganese PRG for RAO 8 and supporting attachments in future revisions of FS Section 2.

13. Changes to RAOs Text

EPA made new major changes to the RAOs, which were not discussed in the 2014 FS technical meetings. The draft FS RAO text was laboriously discussed, and the LWG and EPA exchanged multiple comments and responses from January to September 2009 to refine and finalize the RAO text. The LWG comments included text on "additional considerations" that further explain the RAOs, which EPA agreed would accompany the RAO text. EPA provided very little explanation at the March 17, 2015 meeting for why these prior agreements and EPA directions are no longer valid. The following are some of the specific LWG concerns with the new RAO text:

- EPA has removed all of the "additional consideration" language that EPA directed the LWG to use in a letter on September 30, 2009. As noted above, this additional language provides critical explanation for the interpretation of the RAOs and how they should be used in the FS. The most important additional consideration no longer explained in the draft revised Section 2 is that the RAOs require risk reduction at the site through sediment remedies, and that other sources of risk (e.g., upland and watershed sourced contaminants) also exist that the sediment remedy cannot directly address.
- EPA added language about "riverbank soils" to three of the RAOs and removed the definition of "site sediments." The definition of site sediments is important clarifying information regarding the subject of the remedy (i.e., contaminated sediments that reside below an elevation of 13.3 feet Mean Low Water North American Vertical Datum of 1988 [MLLW NAVD88]).[1] By removing this definition and including "riverbank soils," EPA has obscured which contaminated media the remedial alternatives are intended to address. As a result, it appears EPA is suggesting addressing riverbank soils above 13.3 feet MLLW NAVD88, which are not subject to the Administrative Settlement and Order on Consent (ASAOC) and were, for that reason, not investigated in the RI. The regulatory approach to riverbank soil cleanup and the variations in riverbank soil cleanup approaches that exist at various sites along the river need to be clarified and made

[1] This distinction has been fundamental to the entire RI/FS. The Administrative Settlement and Order on Consent provides that "RI/FS work for uplands facilities is being or will be conducted pursuant to separate agreements or orders issued by DEQ or EPA and is not covered by this Order which is for the in-water portion of the Site." The EPA/DEQ *Portland Harbor Joint Source Control Strategy*, December 2005, at page 2-2, explains, "Under the MOU, the DEQ was designated the lead for the identification and control of upland contaminant sources to the Portland Harbor Superfund Site. . . .The EPA was designated lead for investigating the nature and extent of in-water contamination... ."

consistent with the authority of the ASAOC and the existing February 2001 Memorandum of Understanding between EPA, DEQ and their partner agencies. EPA provided some oral explanation on March 17, 2015 for some of these changes and how EPA now intends to approach riverbank remediation in the revised FS alternatives. The LWG continues to disagree with these RAO changes based on EPA's recent oral explanations, and regardless, points out that the current draft revised FS Section 2 does not describe the river bank approach orally described by EPA on March 17, 2015.

- EPA changed the general format of the RAOs from language about "reducing risk to acceptable levels" (through sediment remedies as discussed previously) to language about "reducing COC concentrations" in riverbank soils, surface water, biota, and sediment. This change makes soil, surface water, biota, and sediment concentration reductions the explicit goals of the remedy. The LWG fundamentally disagrees that concentration reductions are the only, or even primary, way that the RAOs can or will be achieved. Consistent with a risk-based framework for sediment remedies (EPA 2005; p. 1-5), the RAOs should focus on reduction of risks to acceptable levels, where possible. Further, the LWG disagrees that PRGs in surface water, riverbank soil, and biota are the primary objective of the remedy. Previously, EPA had indicated in FS technical discussions, and the LWG agreed, that levels in surface water and biota would be considered "targets" (not PRGs), given that a sediment remedy alone may not be able to achieve acceptable levels in these media. EPA appears to have abandoned that approach with the new RAO language and directly links success of the sediment remedy to achieving specific concentrations in surface water and biota. Further, the RAOs imply that acceptable risk levels will be achieved using the sediment, water, and biota PRGs, but some of the PRGs are based on background values and still present unacceptable risk.
- Edits to groundwater RAOs specify that the groundwater PRGs are measured in porewater. In the draft revised Section 2, EPA defines porewater as water residing in the sediment biologically active zone (p. 2-10). This approach and definition of porewater is different than the definition of TZW, defined as the top 30 centimeters, which is used throughout the RI/FS. EPA previously required the field sampling and analysis for groundwater impacts in the RI/FS to focus on TZW, which may not relate directly to concentrations in biologically active zone porewater. These TZW values were used in the Baseline Ecological Risk Assessment (BERA) to estimate risks to ecological receptors in the biologically active zone, but given the differences between TZW and biologically active zone, the results of these risk estimates cannot be used to define COCs. Also, in human health RAO 4, EPA indicates that MCLs and AWQC are the PRGs as measured in porewater, but those criteria are not applicable to porewater, given the point of exposure to people will be in the surface water and, for drinking water, at

Do Not Quote or Cite
This document is currently under review by US EPA and its federal, state and tribal partners, and is subject to change in whole or part

point of use. Regardless, the LWG does not agree there should be any PRGs for groundwater at the site, for reasons discussed in our June 2014 comments.

EPA Response: EPA Region 10 has modified the RAOs in consultation with EPA HQ to be consistent with EPA policy and guidance and other sediment remedies.

The additional considerations appeared to be risk management recommendations, thus they were eliminated from the RAO discussion. The RAOs themselves clearly define that risk reduction is the primary goal and will be achieved by reducing concentrations of COCs to acceptable levels. EPA has also added language that clarifies achieving the RAOs relies on the remedial alternatives' ability to meet achievable final remediation goals/cleanup levels derived from PRGs. At this point Table 2.2-1 provides PRGs which are based on such factors as risk, ARARs, and background. PRGs may be further modified through the evaluation of alternatives and the remedy selection process. Final remediation goals/cleanup levels will be selected in the Record of Decision.

EPA has developed a new RAO for riverbank soils. This clarifies the media of which the RAO is meant to address. The AOC does not limit the selected remedy to river sediments. EPA is using information in the risk assessment that demonstrate that contamination in riverbanks pose an unacceptable risk via recontamination, and therefore action under CERCLA is warranted.

Reducing contaminant concentrations in the environment is the primary means for achieving remedy protectiveness. EPA disagrees with the LWGs interpretation that reductions in contaminant concentrations should not be a primary component of the remedy. Since tissue concentrations in fish represent a primary source of risk to human and ecological receptors, they also represent the most direct manner through which to assess risk reduction. EPA believes that reductions in surface water and biota concentrations will be achieved through reductions in sediment and riverbank soil concentrations and ongoing source control efforts. EPA will continue to consider how the remedy will address tissue and surface water concentrations.

The only water media at the site are groundwater and surface water. TZW and pore water are not environmental media. TZW is the area in which groundwater and surface water mix beneath the sediment/surface water interface. Pore water is the location in the sediments where benthic organisms are likely to reside. The establishment of PRGs in pore water for RAOs 4 and 8 are meant to protect the river from releases of contaminants in groundwater. The BERA used the information to determine where ecological risks were potentially unacceptable. Elevated concentrations in pore water are indicative of potential risk to benthic organisms, and releases to surface water.

LWG Response: The LWG is concerned that EPA's response implies that EPA made the decision to remove the RAO "additional considerations" text based on how the text "appeared" to EPA. Please see the original comment regarding the record and EPA's former direction on the RAOs additional considerations text.

To comment further, the LWG would need clarification regarding this sentence with respect to the exact language being added: "EPA has also added language that clarifies achieving the RAOs relies on the remedial alternatives' ability to meet achievable remediation goals/cleanup levels derived from PRGs." How is this similar or different than the original additional consideration language that indicated the RAOs are objectives to the extent they are achievable "through sediment remedies"?

Also, EPA indicates that the AOC does not limit the selected remedy to river sediments. The LWG disagrees with this determination, and the LWG can provide more information supporting this position as needed.

The LWG disagrees with EPA's characterization of its position with respect to contaminant concentration as "the LWG's interpretation that reductions in contaminant concentrations should not be a primary component of the remedy." The LWG agrees that contaminant concentrations as compared to RGs will be an important part of the remedy. However, those RGs should be selected on the basis of RAOs that are focused on risk reduction.

Finally, EPA indicates that EPA will continue to consider how the remedy will address tissue and surface water concentrations. Does this include the possibility that EPA will recognize in the FS that some of these concentrations may not be achievable through sediment remedies?

14. Surface Water and Tissue PRGs

In addition to the changes in the RAO text, EPA changed surface water and tissue "target levels" in the August 2014 version of Table 2.2-1 to "PRGs." EPA is reversing past agreements that these media, particularly biota, should not be subject to remedial goals. The LWG has specifically previously commented that only sediment levels should be referred to as PRGs because other chemical sources impact water and tissue levels. Combined with the RAO language changes, the draft revised Section 2 now explicitly suggests that certain surface water and biota concentrations are remedial goals, and eventually cleanup levels, for the site.

EPA Response: Refer to EPA responses to LWG comments #3 and #4.

LWG Response: No further response.

15. Target Areas and Volumes for Remediation

EPA described in the March 17, 2015 meeting that EPA identified areas selected for "remediation" in Section 2.2.6 by mapping the lowest PRGs on a point-by-point basis and identifying the volume of remediation by apparently assuming 10 feet of removal over the entire study area. (It is noteworthy that the draft revised FS Section 2 text does not explain or refer to any place the reader can find an explanation of this remediation area mapping, or the volume determinations.) The areas mapped in Figure 2.2-2 are inconsistent with the risk assessments and represent a fundamental misapplication of the PRGs at inappropriate spatial scales. Also, the stated volume in no way relates to volumes of sediment that may pose risk or likely future risk.

EPA Response: Per EPA guidance (USEPA 1988) an initial determination is made of areas or volumes of media to which general response actions might be applied during the development of alternatives. This initial determination is made for each medium of interest at a site. To take interactions between media into account, response actions for areas or volumes of media are often refined after site wide alternatives have been assembled. EPA has removed the volumes from the text of the FS, but has retained the acres. The map is showing the areas where the current initial PRGs are exceeded. EPA will be assigning various technologies, including MNR, to address areas of the site to meet these PRGs to ensure adequate risk reduction. EPA will clearly identify the areas (acres) of the site where each technology will be applied in the alternative development (Section 3 of the FS).

Refer to EPA responses to LWG comment #3 regarding appropriate spatial scales.

LWG Response: EPA's response indicates the map shows areas were the current initial PRGs are exceeded. Many of these same PRGs are exceeded upstream of the site boundary as well, but the map does not show these areas of exceedances. The LWG requests that EPA revise the map to show PRG exceedances outside the Site boundaries to help put these exceedances in perspective for the reader.

16. Inconsistent Development of Fish/Shellfish Consumption PRGs

In Appendix B1 Section 1.2.1, EPA presents one PRG calculation for fish and shellfish consumption PRGs. Consumption rates are different for fish and shellfish, and EPA has indicated that a shellfish consumption rate was input to this calculation to develop the shellfish consumption sediment PRG for carcinogenic polycyclic aromatic hydrocarbons (cPAHs). (EPA has indicated that the cPAH sediment PRG is the only one based on shellfish consumption.) However, the tissue PRG EPA presents in Table 2.2-1 for cPAHs is based on fish tissue with a value of 0.05 µg/kg ww. Given that the sediment PRG for cPAHs is for clam consumption, the tissue PRG should also be based on shellfish consumption and should be changed to a value of 7 µg/kg ww. Also, aldrin is a COC only for shellfish consumption, so the aldrin tissue and sediment PRGs should be based on shellfish consumption, not fish consumption as EPA currently presents. EPA needs to provide clear sediment and tissue PRGs in PRG development for fish or shellfish consumption that do not confuse these two pathways.

Similarly, EPA's draft revised FS Section 2 indicates that "[r]isk-based PRGs protective of fish/shellfish consumption were not developed for arsenic, mercury, BEHP, and PDBEs because a relationship between tissue and sediment concentrations could not be determined." However, EPA presents other PRGs that have this same lack of relationship. For example, as noted above, EPA presents for cPAHs a sediment PRG based on clam consumption as a "surrogate" for fish consumption risk and a tissue PRG for fish tissue (instead of shellfish tissue). Site data indicate there is no relationship between levels of this COC in sediments and fish tissue, and EPA has orally agreed in FS technical meetings. Because the fish and shellfish consumption scenarios are completely different, the cPAH sediment PRG proposed by EPA does not address this lack of relationship between fish and sediment. EPA should be consistent in the determination of fish consumption PRGs across all chemicals.

Also, EPA should maintain consistency with other regional EPA cleanups. Specifically, the Lower Duwamish Waterway (LDW) Record of Decision (ROD; EPA 2014) concludes that development of a sediment cPAH PRG for the human health seafood consumption pathway was inappropriate because there is no observable relationship between cPAH sediment and tissue concentrations. The LDW ROD discusses the need for future investigations of the sediment/ tissue relationships for cPAHs (EPA 2014). Therefore, EPA defined the LDW sediment cleanup footprint based on other cleanup levels for PAHs (e.g., human direct contact with sediment).

EPA Response: The sediment PRG of 3,950 µg/kg for cPAHs is based on a shellfish consumption rate of 3.3.g/day and a target tissue concentration of 7.1 µg/kg. Table 2.2-1 will be revised to reflect this change. Aldrin is retained as a COC for fish consumption because it is rapidly converted to dieldrin in the environment and organisms, and dieldrin poses unacceptable risk humans via consumption of fish.

The LWG erroneously states that EPA "orally agreed" in FS technical meetings that there is no relationship between PAHs in sediment and fish tissues. In fact, EPA has long maintained that there is a clear relationship between PAHs in sediment associated with the MGP waste at the NW Natural site, and reported PAH concentrations in small home range fish collected from that area. Further, as EPA has stated, it appears apparent lack of a relationship between sediment and tissue concentrations is because LWG attempted to establish a relationship only on a site-wide scale, rather than on a localized scale. EPA has also "orally stated" in FS technical meetings that

Do Not Quote or Cite
This document is currently under review by US EPA and its federal, state and tribal partners, and is subject to change in whole or part

the observed relationship between PAHs in sediment and fish at NW Natural is possibly the result of saturation of enzymatic metabolic pathways, and that tissue PAH concentrations were most likely represented by a threshold relationship. Thus, PAH concentrations less than the threshold would likely not be associated with PAHs in tissue. The range of this threshold might be ascertained by examining measured PAH concentrations in sediment in other areas of the site where co-located tissue samples are non-detect for PAH compounds. In the absence of this or a similar analysis, EPA has established a sediment PRG for PAHs based on the unacceptable risks identified in the BHHRA associated with consumption of shellfish. Since a more linear relationship was established between PAH concentrations in sediment and shell fish tissue, EPA is satisfied that the PRG based on consumption of shellfish is likely protective of consumption of PAH-contaminated fish from RM 6W.

LWG Response: See LWG response to EPA response on Comment 9, where it indicates that the LWG believes EPA has no basis upon which to judge that a PRG based on shellfish consumption is likely protective of the fish consumption scenario. In addition, EPA hypothesizes in the response to Comment 16 that a threshold of sediment PAH concentrations might be ascertainable through further data analysis that would allow a relationship between PAHs in sediments and fish tissue to be determined. The LWG disagrees that any such threshold is present in the existing data and also disagrees that such a hypothetical analysis could lead to determining a relationship between the two media that would allow calculation of a technically valid fish consumption sediment PRG for PAHs.

17. Use of Bioaccumulation Water Criteria for Surface Water and Groundwater PRGs

EPA is using organism + water bioaccumulation criteria for human health surface water and groundwater PRGs (RAOs 3 and 4). EPA previously agreed in FS technical discussions that organism-only criteria should be used and shown under the bioaccumulation RAO (RAO 2) only. EPA further agreed that direct contact/water ingestion criteria should be used for surface water and groundwater PRGs, as shown in EPA's last version of the PRGs table (August 6, 2014). EPA has now reversed this decision and changed the surface water and groundwater PRGs for RAOs 3 and 4 back to organism+water values. EPA mentioned at the March 17, 2015 meeting that this change was made because PRGs should be media-specific not pathway specific. The LWG does not understand this explanation or how it is consistent with regulations and guidance or with how EPA assigned other PRGs to the various RAOs.

EPA's water PRGs are now often the same across RAOs 2, 3, and 4. However, confusingly, the values of the PRGs are sometimes different in RAOs 3 and 4 compared to RAO 2. For example, for cPAHs, a criterion of 0.0018 micrograms per liter (µg/L) is shown in RAO 2, but a criterion of 0.0013 µg/L is shown in RAOs 3 and 4 (see also DDx for a similar situation). EPA indicates in two different places that it is using organism-only criteria for RAO 2 and organism + water criteria for RAOs 3 and 4, but does not explain the reason for this difference and how it relates to differences of the RAOs.

Confusingly, EPA indicates the following in Section 2.2.2.1: "EPA regional screening levels (RSLs) for tap water (EPA 2014) were used as the risk-based PRGs for RAOs 3 and 4." But then it indicates in Section 2.2.3 that "[t]he PRGs for RAOs 3 and 4 were selected from the State of Oregon AWQCs (organism + water) and MCLs presented in Table 2.1-4." The various draft revised FS Section 2 tables show RSLs, Maximum Contaminant Levels (MCLs), and bioaccumulation Ambient Water Quality Criteria (AWQC), but the process for selection of any particular value for RAOs 3 and 4 is not clearly defined in the supporting tables or text.

EPA Response: EPA had previously agreed to adding organism only HH AWQCs for RAO 2. After further discussions with EPA HQ, it was determined that RAO 3 covers all uses of surface water. Thus, surface water for RAO 2 has been removed. The organism+water HH AWQCs and MCLs are protective of all uses of the surface water, so those values are being used to develop PRGs for surface water. RSLs are only being used for COCs that do not have a criterion for organism+water HH AWQCs or MCLs. EPA has further modified the RAOs and has provided additional language to help clarify this. While some values may be the same for RAOs 3 and 4, there are different COCs and where and how they are applied is different.

LWG Response: No further response.

18. Potentially Unacceptable Risk

EPA refers in multiple locations to contaminants posing unacceptable risk (e.g., last sentence of the first paragraph of Section 2.2.1). This and any similar language should refer to <u>potentially</u> unacceptable risk. This is not an issue of semantics; contaminants with HQs greater than or equal to 1 were not identified as posing unacceptable risks in the BERA. Similarly, the BHHRA determined potentially unacceptable risks.

EPA Response: The sentence referred to by the LWG has been deleted and replaced with different text that eliminates the need for this change.

LWG Response: The LWG would like to clarify that the LWG's comment was not exclusively about this one sentence. The LWG believes that, to be consistent with the risk assessments, the phrase "potentially unacceptable risk" should be used in all cases throughout the revised FS.

19. Benthic Toxicity Narrative PRG

EPA indicates in Table B-2 that EPA is comparing the bioassay responses to negative control. This is technically incorrect. The toxicity thresholds were derived and applied based on comparison to reference envelope values (positive controls), which should be the basis for any narrative PRGs.

EPA Response: This is being eliminated as a PRG and will be used as a RAL in Section 3. EPA will revise the text to note that survival must be statistically significantly lower than the reference envelope positive controls.

LWG Response: Although there was some discussion of this at the April 10, 2015 meeting, we are somewhat unclear on how bioassays can be used as a RAL in Section 3 of the FS. Can EPA elaborate on what this means? For example, Section 3 will present the SMAs for each alternative, which includes the CBRAs. (The CBRAs have been used up to this point as a form of RAL for defining SMAs where sediments would be actively remediate to address benthic risks in each alternative.) To comment further, the LWG would need to understand whether EPA is saying that, instead of the CBRAs, EPA is now using bioassay results exclusively to define the benthic toxicity portion of the SMAs in Section 3? Or is EPA saying that bioassay results will be one of many elements to the CBRA approach presented in Section 3?

20. General Response Action (GRA) Descriptions

Per Comment 11, the LWG recommends that the descriptions of the GRAs and the remedial technologies adhere more closely to guidance to avoid potentially biased descriptions of the GRAs and technologies. Often, the GRA descriptions used in Section 2.3 appear to emphasize the cons of less intrusive technologies and the pros of the more intrusive technologies.

EPA Response: The descriptions of the GRAs was developed using EPA guidance. It is unclear what LWG's objections are to the descriptions and what additional language they want added to provide a more balanced discussion.

LWG Response: If EPA would find it productive, the LWG would be willing to submit specific examples of potentially biased language and how that compares to language in the guidance.

21. In Situ Treatment Description

There is minimal description of the in situ treatment GRA. The text also indicates for this technology alone that site-specific pilot studies may be needed, although this technology has been well established in the last few years. The LWG's position is that in situ treatment does not require pilot studies to any greater degree than other technologies currently under consideration, particularly in comparison to ex situ treatment. For in situ treatment, the EPA guidance (EPA 2005) is significantly out of date, and new information consistent with more recent publications should be summarized here (see the draft FS Section 6 discussions for a starting point). Also, the text confuses elements of in situ treatment and enhanced MNR, which should be described as distinct technologies as in the guidance.

EPA Response: EPA will review the information presented in Section 6.2.4, and incorporate the information into the revised Section 2 as appropriate.

LWG Response: The LWG would like to clarify that even more recent information on in-situ treatment is available since the draft FS was prepared, although we think the draft FS Section 6.2.4 is still relevant and accurate. If EPA would find it productive, the LWG could submit additional, more recent references on in-situ treatment for EPA's consideration.

22. Dewatering Treatment Description

The wastewater treatment discussion in Section 2.4.3.3 makes assumptions about how dredge dewatering can be controlled and where it will be discharged (if at all) that are misleading and do not encompass the full range of technology options for dewatering. The text discusses wastewater treatment plants only, implying that this is the only way to manage dewatering. Many other approaches exist for handling and discharging dewater including, but not limited to, on-barge water treatment, addition of amendments to bind or absorb water, use of upland transfer or disposal holding areas to allow water to clarify before discharge, and discharge to publicly operated existing treatment facilities. Also, discharge mixing zones are commonly used on environmental dredging projects in combination with one or more of the above options, and this element of dewater discharge is not discussed at all.

EPA Response: EPA will consider inclusion of the other suggested process options for dewatering in revisions to the text and tables of FS Section 2.

LWG Response: No further response.

23. Retained Disposal and Ex Situ Treatment Options

Section 2.4.5 implies that EPA has retained three disposal options (off-site landfill, "a RCRA disposal facility," and a Confined Disposal Facility [CDF]) for development of alternatives. However, based on FS technical discussions, the LWG's current understanding is that EPA intends to develop alternatives in Section 3 that only include off-site landfills. It is unclear how Section 2.4.5 is consistent with EPA's intentions for Section 3 and what it means for the alternatives eventually developed there.

Also, in Table 2.4-2, the Arkema CDF should be retained as a disposal option. EPA does not provide a supportable technical argument against the Arkema CDF. Further, it is not in the spirit of the Arkema Engineering Evaluation/Cost Analysis and the recent Albright opinion regarding the Legacy Site Services (LSS) data collection work plan to screen out the Arkema CDF at this time. The LSS work plan will develop the data required to fully evaluate a CDF and, therefore, the CDF cannot be reasonably screened out at this time in absence of the work plan information.

Also, for ex-situ treatment technologies, EPA retained soil washing, despite the fact that it was screened out in the 2012 draft FS consistent with early draft technology screening tables provided to EPA. This technology was also evaluated extensively at other sediment cleanup sites (including the LDW) and screened out due to the lack of demonstrated success. It is particularly ineffective when substantial fines are present in the sediments. EPA acknowledges in draft revised FS Section 2 that the site contains a large percentage of fines in many locations.

EPA Response: EPA has retained both off-site landfills and CDFs as disposal options. The Port of Portland T4 CDF is retained as the representative CDF option for the site. The Arkema CDF was not retained because it did not meet all the design criteria required by EPA. Refer to the attached evaluation. EPA has screened out soil washing.

LWG Response: This issue was discussed some during the April 10, 2015 meeting. Our understanding based on that discussion is that EPA intends to include CDFs in any alternative that produces a dredge volume that is more than 1.5 times the capacity of the T4 CDF (using T4 as a surrogate for CDFs in general). However, CDFs will only be included as an option to those alternatives and will only be evaluated with regards to the cost criterion (i.e., whether the alternative would cost more or less than a similar alternative using an upland disposal option). The LWG requests that EPA verify that the above understanding is correct. Also, the LWG continues to have concerns that evaluating CDFs only for the cost criterion could miss some important differences between upland and CDF disposal options, such as short term effectiveness and implementability, which could impact the selection of a preferred alternative.

25. Application of CBRA

While the CBRA integrates multiple lines of evidence and defines areas that may be the subject of further evaluation, testing to rule out false positives is essential.

EPA Response: EPA is not using the CBRA to develop numeric PRGs in the FS.

LWG Response: No further response.

REFERENCES

DEQ, 2014. Portland Harbor Upland Source Control Summary Report. Prepared by Oregon Department of Environmental Quality, Northwest Region Office. November 21, 2015. Portland, Oregon.

EPA, 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. Interim Final. EPA/540/G-89/004. OSWER Directive 9355.3-01. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, DC.

EPA, 1991. Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions, p.3 (OSWER Directive 9355.0-30, April 22, 1991).

EPA, 2002. Transmittal of Policy Statement: "Role of Background in the CERCLA Cleanup Program." From Michael B. Cook, Director of Office of Emergency and Remedial Response to Superfund National Policy Managers Regions 1-10. OSWER 9285.6-07P. May 1, 2002, Washington, D.C.

EPA, 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites. EPA 540-R-05-102. OSWER 9355.0-85. December 2005. Washington, D.C.

EPA, 2014. Record of Decision Lower Duwamish Waterway Superfund Site. EPA Region 10. November 2014. Seattle, Washington.

LWG LOWER WILLAMETTE GROUP

Chairperson: Bob Wyatt, NW Natural
Treasurer: Frederick Wolf, DBA, Legacy Site Services for Arkema

September 8, 2015

Kristine Koch
U.S. Environmental Protection Agency, Region 10
1200 Sixth Avenue, Suite 900, M/S ECL-115
Seattle, WA 98101-3140

Re: List of significant comments on EPA Feasibility Study Section 3 and 4 (Lower Willamette River, Portland Harbor Superfund Site, USEPA Docket No: CERCLA-10-2001-0240)

Dear Kristine:

Consistent with Jim Woolford's instructions (conveyed by Cami Grandinetti in an April 7, 2015 email), the Lower Willamette Group is submitting its list of significant comments on Sections 3 and 4 of EPA's Feasibility Study within three weeks of our August 21 receipt of Section 4.

Although our review of the EPA FS is ongoing,[1] the enclosed technical memorandum discusses flawed assumptions, serious technical deficiencies, and major policy inconsistencies amounting to systemic errors that cannot be addressed in an isolated manner because they go to the core of alternatives development. The following examples illustrate that the LWG's concerns do not seek mere refinements at the margins but rather identify fundamental flaws in EPA's methodologies, resulting in conclusions that are contrary to our understanding of National Contingency Plan (NCP) requirements and relevant EPA guidance and therefore preclude any useful comparison of remedial alternatives.

1) Incomplete evaluation of the alternatives and their effectiveness. The FS does not present technically supportable analyses to make a meaningful comparison of the set of alternatives. The individual and comparative analysis of alternatives is almost entirely qualitative, and most of the results and conclusions on the evaluation of the alternatives using the NCP criteria are unsupported and highly subjective. The lack of meaningful and reproducible metrics results in a qualitative and highly subjective comparison of the effectiveness of and differentiation among the alternatives. In particular, the absence of quantitative analysis for the long-term effectiveness evaluation, such as estimates on future sediment concentrations after construction completion, obviates the required long-term effectiveness and protectiveness evaluations. There is no basis in EPA's FS to state that the smaller alternatives will not achieve the same risk reduction as the larger alternatives without any estimate of sediment concentrations or other quantitative assessment.

[1] The LWG has submitted a written request for additional information related to EPA's FS.

EPA's evaluation includes no attempt to quantify natural recovery.   Although EPA acknowledges that natural recovery is occurring at Portland Harbor, EPA has discarded nearly all the empirical data and analyses presented in the Remedial Investigation Report, along with both the QEAFate model developed by the LWG for the 2012 draft FS and its own SEDCAM model, in favor of a highly qualitative estimate of the role of natural recovery in the long term effectiveness of the alternatives. This decision leaves EPA with only a single quantifiable measure of performance for its alternatives: estimated sediment concentrations immediately following construction.

We don't understand EPA's decision to abandon its efforts to quantify natural recovery. The EPA Sediment Guidance counsels:

> "The time needed until protection is achieved can be difficult to assess at sediment sites, especially where bioaccumulative contaminants are present. Generally, for sites where risk is due to contaminants in the food chain, time to achieve protection can be estimated using models. These models may have significant uncertainty, but may be useful for predicting whether or not there are significant differences between times to achieve protection using different alternatives. When comparing time to achieve protection from MNR to that for active remedies such as capping and dredging, it is generally important to include the time for design and implementation of the active remedies in the analysis."[2]

Recovery curves generated by EPA's SEDCAM model[3] show a general trend of natural recovery within a reasonable timeframe similar to the LWG's QEAFate model. The outputs by two independent models, which correlate with the empirical data, would seem to reduce the uncertainty associated with the QEAFate model rather than support EPA's conclusion that all models are too unreliable for the purposes of the FS.

EPA's decision to abandon efforts to quantify natural recovery undermines the validity of the detailed analysis of alternatives in the FS:

- EPA is left with no real measure to demonstrate that the threshold criterion of protectiveness is met by <u>any</u> of its alternatives. EPA's "Summary of Comparative Analysis of Alternatives" (Table 4.3-1), for example, states, for every alternative, "Time to achieve protectiveness through MNR is uncertain."
- EPA is unable to compare the time to achieve RAOs and other short- and long-term effectiveness criteria in any more than the most general terms (For Alternative F, the "estimated time to achieve RAOs is uncertain, but less than for E"). These conclusions are not supported by the Conceptual Site Model as detailed in the attached Comment 13.
- The lack of any quantitative analysis of natural recovery precludes any meaningful evaluation of the cost effectiveness of the alternatives. For

---

[2] *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*. EPA Office of Solid Waste and Emergency Response. §2.4.1 OSWER 9355.0-85. December 2005.
[3]Please see Attachment 1. EPA showed these recovery curves at the July 31 FS "roll out" meeting.

example, will the $1.5 billion cost differential between Alternatives G and B get us to protectiveness 10 years sooner, 1 year sooner or ever?

2) EPA's set of alternatives are not implementable as described in the FS. The FS fails to adequately consider critical implementation issues that will substantially increase the time, difficulty, and cost of conducting the cleanup. Many of EPA's assumptions about production times, volumes and costs are inconsistent with experience at other sediment sites and do not appear to be physically possible in practice. To take just one example, EPA's production calculations assume that dredging will proceed 24 hours per day, 6 days per week, during the entire four month in-water work window each year, for many years on end. EPA's assumptions do not include any estimate of dredging efficiency (as was used in the Duwamish FS), including time necessary to reposition the dredge along its dredging lane, move barges receiving the dredged materials in and out of the work area, install and maintain water quality controls or perform water quality monitoring. EPA also briefly mentions but quickly dismisses the very probable objection of the community to light and noise pollution in nearby residential neighborhoods associated with long term 24 hour construction work. For these and other reasons, EPA's production assumptions are demonstrably incapable of attainment in the real world, and result in a skewed comparison of alternatives re short- and long-term effectiveness and implementability.

   The unrealistically optimistic production rates lead to significant underestimation of both construction time frames and potential remedy costs. Overly optimistic estimates about the time to complete construction undermine EPA's assessment of the long- and short-term effectiveness of each alternative (longer time required to reach RAOs, longer short term risk due to higher fish tissue concentrations during construction, more quality of life disruption to the community, etc.) and compound in a way that could significantly change the conclusions about more aggressive approaches (if EPA's production rates are off by a factor of 2, Alternative B would take 8 years, rather than 4 years to complete, whereas Alternative G would be in construction for 36 years rather than 18). Similarly, underestimation of likely actual remedy costs precludes meaningful comparison of the cost effectiveness of EPA's alternatives, as required by the NCP. As discussed above, this problem is compounded by the lack of any metric to consider the effects of natural recovery before, during, or following construction.

   The extremely high costs for the five alternatives (ranging from $1 billion to $4 billion in current dollars) are not proportional to the overall effectiveness of these alternatives, and the alternatives are impracticable to implement. In comparison, the LWG identified a set of alternatives that achieved substantial and similar risk reduction, were implementable, and cost-proportional to the alternatives' overall effectiveness. In the LWG's draft FS, the greatest degree of overall effectiveness was achieved by alternatives that ranged in cost from $169 to $398 million.

3) Significant divergence from how issues handled at other sediment sites. EPA prematurely and prescriptively applies a number of requirements increasing the cleanup costs by hundreds of millions of dollars while achieving no real risk

reduction benefit at the Site. EPA's application of extremely low and unprecedented thresholds to identify "principal threat waste" means large quantities of material that EPA acknowledges can be reliably controlled through capping will be subject to costly in situ treatment that provides no actual additional risk reduction. Other "principal threat" materials removed from sediments or riverbanks must be treated prior to disposal in a permitted landfill, although EPA undertakes no analysis of whether treatment prior to landfilling has any risk benefit. Similarly, EPA's FS seems to indicate that dredged or excavated materials that are not hazardous wastes must nonetheless meet hazardous waste land disposal restrictions – and not merely the land disposal restrictions applicable to remediation waste, but those applicable to as-generated industrial hazardous wastes (most of which are, again, well below DEQ risk-based cleanup standards for soil). The significant burdens EPA's FS places on the management of remediation wastes have the potential to increase costs by hundreds of millions of dollars without any associated risk reduction.

Prescriptive assignment of treatment technologies across all alternatives is inconsistent with the NCP requirement to develop a range of alternatives requiring different degrees of treatment for source materials. 40 CFR 300.340(3)(i). It results in more aggressive remedial alternatives scoring higher for "reduction of toxicity" because of "treatment" without any quantitative or even qualitative evaluation of whether the reduction in toxicity is achieved by the treatment technology or simply by preventing exposure. Requiring unnecessary treatment of risks already controlled through capping or removal and offsite disposal certainly increases cost, but the absence of any alternatives that include less treatment preclude any evaluation of the cost effectiveness of treating these materials.

One real point of comparison is the McCormick & Baxter NPL site, the in-water portion of which is within the Portland Harbor site. EPA has concluded that the existing sediment cap at McCormick & Baxter "is protective of human health and the environment because the remedy required by the ROD has been implemented, and is working as intended."[4] The in-water remedy at the McCormick & Baxter site cost $12 million.[5] If the approach from EPA's FS were applied to McCormick & Baxter, construction costs would range between $445 million and $520 million[6], largely because the contamination at McCormick & Baxter would qualify as "principal threat waste" per EPA's unprecedented definition of that concept.

4) <u>Focus on mass removal rather than risk reduction</u>. EPA's FS focuses on reducing chemical concentrations rather than on managing the most important risks at the site. All of EPA's alternatives are evaluated solely against the highest risk estimates and most conservative risk scenarios identified in the baseline risk assessments in the absence of any application of risk management principles, and in ways that are themselves inconsistent with the risk assessments. The effectiveness of the

[4] *Third Five-Year Review Report, McCormick & Baxter Creosoting Company Superfund Site* (EPA and DEQ, September 2011)
[5] *Preliminary Close Out Report, McCormick & Baxter Creosoting Company Superfund Site* (EPA, September 2005)

alternatives at cleaning up PCBs, for example, is evaluated based upon a far more conservative assumption (1 river mile exposure area split longitudinally into three parts) than was used in the Baseline Human Health Risk Assessment (one whole river mile for smallmouth bass fish consumption and as large as site-wide for other exposures). EPA's alternatives require large areas of total PAH cleanup, despite the fact that carcinogenic PAHs represent less than 1% of the cumulative risks to people who eat fish, and EPA has no technical basis to expect that cleaning up large areas of PAHs would have any meaningful impact (i.e., reduction) on overall fish consumption risk. Although EPA's approved Baseline Ecological Risk Assessment defined areas of benthic risk through a nuanced comprehensive benthic risk area approach that considered multiple lines of evidence, the FS completely abandons the comprehensive benthic approach in favor of some off-the-shelf screening level values, and then demerits all of its alternatives because they do not comprehensively address benthic risk.

EPA's decision to focus so intensely on contaminant mass reduction means that the FS includes no tools for EPA and other stakeholders to evaluate the magnitude of meaningful risk reduction achieved by the various alternatives against other important considerations. EPA's FS does not include information necessary for EPA to compare, rank, and prioritize risk and compare the cost effectiveness of cleanup options to reduce that risk.

5) Prescriptive technology assignments. EPA uses a prescriptive set of technology evaluation and scoring criteria to determine the technologies to be applied in each area of the Site. By assigning one technology to the same sediment areas in the technology screening step, the technology assignment prevents meaningful comparison of the performance of technologies and limits the evaluation of multiple technologies performing equally effectively. And because the technology assignment is based on an FS level of information, the prescriptive set of evaluation criteria will not appropriately or accurately predict the most appropriate technology assignments or configurations for Remedial Design (RD). Finally, this prescriptive approach does not accommodate flexibility for RD when additional information and analysis will be conducted.

These examples illustrate that simply modifying or correcting a few assumptions and calculations will not shore up the alternatives development and evaluation in EPA's FS.

[6] Using EPA's methods as best we can reproduce them, this includes a contingency range from 20% to 40%, presented in 2015 current dollars, and not including long term operations, maintenance, and monitoring costs.

As a result, the LWG is concerned that EPA's FS does not currently present alternatives that are likely to be implemented by potentially responsible parties through settlement. The LWG strongly urges EPA to resolve these systemic problems with the FS before using it as a foundation for remedy selection.

Sincerely,

Bob Wyatt

cc:

Jim Woolford, U.S. Environmental Protection Agency
Steve Ells, U.S. Environmental Protection Agency
Cami Grandinetti, U.S. Environmental Protection Agency, Region 10
Sean Sheldrake, U.S. Environmental Protection Agency, Region 10
Confederated Tribes and Bands of the Yakama Nation
Confederated Tribes of the Grand Ronde Community of Oregon
Confederated Tribes of Siletz Indians of Oregon
Confederated Tribes of the Umatilla Indian Reservation
Confederated Tribes of the Warm Springs Reservation of Oregon
Nez Perce Tribe
Oregon Department of Fish & Wildlife
United States Fish & Wildlife
Oregon Department of Environmental Quality
LWG Legal
LWG Repository

LIST OF SIGNIFICANT ISSUES WITH EPA'S REVISED FS SECTIONS 3 AND 4

1 INTRODUCTION

This memorandum contains a list of significant issues with EPA's Portland Harbor Site (Site) Revised FS Section 3 dated July 29, 2015 and Section 4 dated August 18, 2015. This list was prepared in response to a request from EPA for the LWG to present their "significant concerns" with EPA's draft FS within 21 days of receipt of the revised FS Section 4 to "help inform the conceptual remedy."[1]

This document presents detailed descriptions of nineteen (19) significant issues. Table 1 demonstrates how each issue could greatly impact the conceptual plan by cross-referencing each significant issue with a) key FS technical themes; and b) the seven CERCLA criteria associated with the detailed analysis of alternatives:

- Two threshold criteria (protection of human health and the environment, and compliance with ARARs), and
- Five balancing criteria (long-term effectiveness and permanence; reduction of toxicity, mobility, or volume; short-term effectiveness; implementability; and cost).

As demonstrated on Table 1, each and every one of the 19 issues is significant because of the ripple effect it has on numerous components of the detailed analysis of alternatives, and hence the conceptual plan. The ensuing comments for each significant issue describe in detail the fundamental flaws identified with EPA's approach. Collectively, these flaws result in a biased set of analyses aimed at supporting the false premise that removal and treatment is the presumptive remedy for contaminated sediment.

[1] Email from Lori Cohen dated April 7, 2015, conveying a memorandum from Jim Woolford that presented EPA's process and schedule for developing the draft FS, conceptual plan, and meeting with the National Remedy Review Board (NRRB).

Table 1. Categories of Feasibility Study Significant Issues

		Key FS Technical Themes				CERCLA FS Evaluation Criteria						
No.	Issue	Development of Alternatives	Implement -ation	Cost	Detailed Analysis of Alternatives	Protective-ness	Compliance w/ ARARs	Long-term Effectiveness	Reduction of Toxicity - Treatment	Short-term Effectiveness	Implement -ability	Cost
1	Technology Assignments	X		X		X		X		X	X	X
2	Principal Threat Waste	X		X		X		X	X		X	X
3	Remedial Action Levels	X		X		X		X		X	X	X
4	Inclusion of Riverbanks	X	X	X		X					X	X
5	Construction Durations	X	X	X				X		X	X	X
6	Volumes	X	X	X						X	X	X
7	Lack of Integrated Designs	X	X	X			X				X	X
8	Discussion of MNR	X				X		X		X		
9	Dredge Release Evaluation	X	X	X		X	X			X	X	X
10	Perfunctory Alternative Screening	X		X		X					X	X
11	Sheetpiles and Other BMPs	X	X	X			X			X	X	X
12	CDF Acceptance Criteria		X		X		X	X	X		X	
13	Incomplete Evaluation of Alternatives			X	X	X	X	X		X	X	X
14	Limited Long-term and Short-term Evaluation				X	X	X	X		X		
15	Inappropriate Benthic Risk Analysis	X			X	X		X				
16	Cost Estimates			X	X							X
17	Risk Inconsistency	X			X	X		X		X		
18	Inappropriate RCRA and Other Waste Determination	X	X	X	X	X	X	X	X		X	X
19	Low Level of Clarity and Consistency	X	X	X	X	X	X	X	X	X	X	X

Notes:

ARAR - Applicable or Relevant and Appropriate Requirement
BMP - best management practice
CDF - confined disposal facility
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
FS - Feasibility Study
MNR - monitored natural recovery
RCRA - Resource Conservation and Recovery Act

2 SIGNIFICANT ISSUE COMMENTS

1. **Technology Assignments –** EPA's revised FS uses a prescriptive set of technology evaluation criteria to determine which technologies will be applied to which areas of the Site. Although we understand that technology assignments are necessary for FS-level alternative development, the LWG continues to believe that such a prescriptive approach based on an FS level of detail will not appropriately or accurately predict the most appropriate technology assignments for Remedial Design (RD) (see LWG-written comments and discussions from April to July 2014; e.g., LWG 2014a). The LWG disagrees that the prescriptive approach in FS Section 3 should be used moving forward into the Proposed Plan, Record of Decision (ROD), and RD. The LWG's past and current comments are consistent with remediation guidance (EPA 1988, 2005a) as detailed for specific issues discussed below:

    a. As previously commented (LWG 2014a), the LWG has many technical disagreements about the scores that were applied to the various technologies. The scores favor dredging and fundamentally misrepresent how engineered caps are designed as required by guidance (discussed more in Comment 1g below; Palermo et al. 1998). Thus, the LWG cannot agree that EPA's revised FS scoring approach is objective and "unbiased" as EPA asserted at the July 31, 2015 roll-out meeting.

       EPA also is substantially increasing Portland Harbor remediation costs without demonstrating an improvement in the remedy. The overall problems with EPA's technology assignment approach are best illustrated by comparing the actual sediment remedy constructed at the McCormick and Baxter site to the remedy that would have been selected for this area using EPA's technology assignment process. LWG applied EPA's process as closely as possible following the available information in Section 3, including PTW, ex situ treatment, and disposal steps. We determined that the likely construction costs for EPA's approach as applied to the McCormick and Baxter site would be approximately $370 million (with no net present value calculation and excluding any contingency allowance, operations and maintenance costs, and long-term monitoring costs). (Additional details of this analysis can be supplied.) The actual cost of the cap construction at the McCormick and Baxter site was $12 million (EPA 2005b). The McCormick and Baxter capping remedy has been shown to be highly effective through several years of post-construction monitoring. Capping is likely an equally effective technology over much of the rest of the Portland Harbor Site (outside the navigation channel) consistent with the findings of the 2012 draft FS. Thus, for other areas within Portland Harbor like McCormick and Baxter that have potential groundwater plumes, potential NAPL in sediments, potential PTW (using EPA's definitions), and shoreline sediment contamination, this comparison indicates that EPA is increasing Portland Harbor remediation costs by approximately 30 times with no demonstrated commensurate increase in effectiveness or protectiveness of the remedy.

b. EPA does not consider physical and engineering constraints that may preclude feasible dredging of deep contamination in the scoring of removal as a technology (see Figure 3.3-14b). This results in EPA designating removal for many areas and then having to cap or backfill those same areas anyway because complete removal is infeasible. Although Figure 3.3-36 provides a general depiction of depth of contamination, this information is not evaluated as a feasibility issue in the scoring matrix for dredging or any other technology.

c. EPA's approach does not develop alternatives that compare the effectiveness (or other FS criteria) of one technology to another as applied to the same patch of sediments, as is indicated by FS and sediment remediation guidance. EPA (1988) indicates the FS should "assemble the selected representative technologies into alternatives representing a range of treatment and containment combinations, as appropriate" (p. 4-3). EPA (2005a) indicates, "The project manager should take into account the size, characteristics, and complexity of the site. However, due to the limited number of approaches that may be available for contaminated sediment, generally project managers should evaluate each approach carefully, including the three major approaches (MNR, in-situ capping, and removal through dredging or excavation) at every sediment site at which they might be appropriate" (p. 3-2). The LWG reviewed FS alternatives developed for five other large sediment sites (Duwamish, Fox, Hudson, Lower Passaic Focused FS, and Housatonic Rest of the River), and in every case, those studies included alternatives that compared the application of one technology (e.g., dredging) to another (e.g., capping) as applied to the same areas of sediments. The LWG can provide additional supporting documentation on compliance with guidance and precedents at other sites, if desired. In contrast, EPA has provided very few references to support its conclusions and recommendations. Direct detailed comparisons of one technology to another would also allow the community to provide meaningful comment on the tradeoffs between more aggressive options that might result in shorter restoration timeframes and less aggressive options that might have fewer quality of life impacts.

   Beyond guidance requirements, EPA's approach ignores fundamental facts about dredging versus capping in general. As the RALs decrease, the depth of contamination becomes deeper, the dredge volumes increase, and the potential for dredging impacts on stable slopes and nearby structure stability increases. Also, as RALs decrease, the ability of dredging alone to effectively meet the RALs is decreased. And the potential effectiveness of a post-dredging cap or cover to provide chemical isolation of remaining contamination increases. These general facts support the concept that the technology assignments should change at a given location across a range of potential RALs and alternatives.

d. EPA's scoring matrix approach does not consider the relative scores of the various technologies. For example, if dredging and capping have a difference in total score of one point for a particular area, they are likely to be nearly equal in terms of feasibility in that area (no strong preference for either technology is indicated). Conversely, a score differential of 5 would indicate a markedly different relative feasibility that may truly indicate one of the technologies is better suited than the other one to that particular area. Instead, EPA simply picks the highest score without considering the magnitude of the scores.

e. EPA's text is unclear whether the prescriptive technology assignment approach is intended for FS assumptions only or will be the basis of ROD or RD determinations. EPA indicated at the July 31, 2015 roll-out meeting that EPA intended for the prescriptive approach to be used, perhaps with refinements, in the ROD as well the FS. For the reasons stated above, the LWG disagrees. Instead, the ROD requirements for technology assignments should be based on performance metrics (e.g., the technology must meet water quality ARARs) and allow RD site-specific integrated engineering assessments to meet those performance requirements at any given location. The LWG has prepared alternate technology decision trees that illustrate how such a performance-based ROD approach supported by RD engineering assessments can accomplished. The LWG can provide these alternate decision trees to facilitate discussions of Proposed Plan contents and ROD requirements.

f. Many steps in EPA's technology assignment approach lack critical analysis (see Comment 19 for more details). For example, EPA indicates that, in some cases, a post-dredge sand cover with activated carbon intermixed (a "reactive layer") will be placed in areas designated by EPA as PTW, after these areas have already been dredged to the RAL. EPA assumed that 2.5% of the dredged material concentration would remain in the post-dredge surface for long-term effectiveness evaluations. Using a PCB concentration of 200 µg/kg (EPA's highly toxic PTW threshold for PCBs[2]), the post-dredge surface sediment layer would have 5 µg/kg of PCBs, which is lower than EPA's background-based PCB Preliminary Remediation Goal (PRG). EPA does not explain why surface sediment concentrations below background levels would require activated carbon treatment.

g. The LWG disagrees with many of the specific assumptions used in the technology assignment approach related to cap design. EPA creates an artificial distinction between "engineered caps" (or sometimes just called "caps") and "armored caps," which ignores several of the recommended approaches on cap design in the capping guidance documents (Palermo et. al 1998). This fundamental guidance on cap design is not referenced in Section 3. For example, the capping guidance is clear that caps must be designed to withstand erosional forces present (e.g., river currents, propwash, and wave action), and all cap designs include an armor component as necessary to resist those erosional forces. Similarly, all caps must be designed for stability on any sloping surface present, and several techniques exist to engineer stable

[2] See Comment 2 with regards to LWG's disagreements with EPA's PTW approach.

DO NOT QUOTE OR CITE This document is currently under review by US EPA and its federal, state and tribal partners and is subject to change in whole or in part.

caps on slopes up to 30 to 40% (LWG 2014b). Thus, EPA's determination that "engineered caps" are less feasible in erosional areas than "armored caps" and that certain caps will be less stable on steeper slopes does not consider all the attributes of a properly designed cap as presented in the guidance.

h. EPA's technology assignment approach uses many technically simplistic assumptions, but it is procedurally difficult to follow. EPA's assignment includes two major process steps, a scoring matrix followed by a set of decision trees, with three large decision trees needed just to explain the second major step. There are numerous inconsistencies between the Section 3 text and the figures and decision trees that attempt to explain the approach. Examples of some of these inconsistencies are provided in Comment 19 below. Thus, it is difficult to determine all the technical issues that may exist with the overall approach.

2. **Principal Threat Waste –** The LWG previously commented (LWG 2014c) that a precise identification and highly quantitative evaluation of PTW at the Site is not necessary or productive for completing the revised FS and is not necessary for EPA's selection of a remedial alternative. Per those past comments, EPA's proposed PTW approach is inconsistent with guidance on PTW (EPA 1991) in several respects. The LWG disagrees with EPA's logic and approach for determining PTW.

   First, EPA uses fish consumption scenarios to determine "direct" cancer risk highly toxic thresholds in excess of 10^{-3}. Before applying such thresholds for PTW identification, the presence of actual risks greater than 10^{-3} needs to be determined. In fact, greater than 10^{-3} risk was not found in the EPA-approved Baseline Human Health Risk Assessment (BHHRA) for dioxin/furan TEQ, total DDx, or BaPEq for any scenario evaluated. Therefore, the definition of highly toxic as described by EPA (1991) is only potentially applicable to total PCBs.

   Second, as described in LWG's past PTW comments (LWG 2014c) greater than 10^{-3} cancer risk was found for PCBs in the BHHRA for three fish consumption scenarios: subsistence (mixed diet, fillet), recreational (mixed diet, fillet), and tribal (whole body and fillet). But EPA guidance (1991) describes PTW materials as a source for "direct exposure." The fish consumption pathways are, by definition, indirect pathways from sediment through fish to people, and these pathways do not represent "direct" exposures from sediment contaminants as described in the guidance. See the LWG's 2014 PTW comments for more details on this issue (LWG 2014c).

   Third, the point-by-point application of EPA's highly toxic thresholds is entirely inconsistent with the spatial and temporal scales associated with this indirect exposure as described in the BHHRA. This includes that people catch fish over multiple areas and fishing events and that the fish range across different areas during those timeframes.

   Fourth, EPA uses inapplicable and inferential evidence to identify potentially highly mobile (i.e., NAPL) material in a manner that is inconsistent with the intent of the PTW guidance. The highly mobile aspect of the PTW definition should be applied for NAPL consistent with situations described in the guidance (EPA 1991), such as "pools of NAPLs submerged beneath ground water or in fractured bedrock, NAPLs floating on ground water" or where physical processes are likely to mobilize "source materials" as defined in the guidance. EPA's identification of any potential NAPL as PTW is inappropriate and inconsistent with the guidance. For example, EPA identifies solid tar materials at Gasco as analogous to highly mobile liquids, which the guidance defines as "liquids and other highly mobile materials (e.g., solvents)." Also, at the Arkema Site, continuous cores have been visually logged and hundreds of samples have been analyzed at the laboratory and, to date, no chlorobenzene NAPL has been found in Arkema sediments. EPA also uses any visual trace observations of NAPL, such as "blebs and globules," to identify highly mobile PTW. This approach is clearly inconsistent with the terms used in the guidance, such as "pools of NAPLs" as quoted above. See LWG 2014c for more description of how EPA's highly mobile PTW approach is inconsistent with the PTW guidance.

Also, EPA's PTW approach is inconsistent with the approach taken at other large river sediment remediation sites, including EPA's recent Region 10 ROD for the Lower Duwamish Waterway, where the maximum sediment PCB concentration was 220 mg/kg. Nonetheless, EPA determined the Duwamish sediments are generally "low-level threat waste" (EPA 2013). In comparison, at Portland Harbor, the maximum PCB concentration is 36 mg/kg, and EPA is identifying concentrations of 0.2 mg/kg as PTW. The LWG's PTW comments (LWG 2014c) review the PTW approach at five other large sediments sites, mostly with much higher contaminant levels than Portland Harbor. All of those sites also do not identify specific PTW areas in the FS process.

Additional specific issues related to the PTW text in Section 3 include:

a. EPA defines areas as PTW without including the reliably contained step of the evaluation described in the NCP and guidance (EPA 1991). Without the reliably contained evaluation included, these areas cannot be appropriately defined as PTW. In other words, only the areas that EPA designates as "not reliably contained PTW" have the potential to actually be defined as PTW. See NCP Preamble, 55 FR 8666 at 8703 (March 8, 1990): "Principal threats are characterized as waste that cannot be reliably controlled in place, such as liquids, highly mobile materials (e.g., solvents), and high concentrations of toxic compounds (e.g., several orders of magnitude above levels that allow for unrestricted use and unlimited exposure)."

b. EPA's not reliably contained analysis using the so called "super cap" approach is also technically incorrect. EPA uses generalized Site-wide groundwater seepage rates for the super cap analysis rather than more localized estimates available in the RI. Further, groundwater control systems exist at both Gasco and Arkema sites, which EPA states were not considered in the analysis. For example, at the Gasco site, the groundwater source control system has been shown to cause negative seepage (i.e., movement of river water down into the sediment bed) over broad areas of the offshore sediments, but EPA's super cap analysis assumes that positive groundwater seepage out into the river is still occurring. Using appropriate seepage parameters where groundwater source control systems exist would result in no identification of not reliably contained material at the Gasco site. A similar

DO NOT QUOTE OR CITE This document is currently under review by US EPA and its federal, state and tribal partners and is subject to change in whole or in part.

analysis is appropriate for sediments offshore of the Arkema site, which has installed a slurry wall and a groundwater extraction and treatment system designed to prevent migration from the uplands to the river. EPA should consider the specifics of that groundwater control system, as well as other areas with significantly lower than average groundwater gradients (e.g., RM 2-4 East).

c. EPA's PTW approach results in large relatively low concentration areas of the Site being identified as PTW. For example, large PTW areas exist outside much of the SMA footprint of the smaller alternatives (e.g., Alternatives B and C), which is a unique circumstance for a sediment FS as far as we are aware.[3] Further, the concentrations that EPA is proposing as PTW would be considered completely safe under other common remedial and regulatory scenarios. For example, EPA's PTW level for PCBs of 200 µg/kg is below EPA's Regional Screening Levels (RSL) for residential soil, which range from 230 to 3900 µg/kg (per EPA's June 2015 RSL residential soil table carcinogenic risk values for total PCBs). DEQ's risk-based residential soil cleanup standard for PCBs is 200 µg/kg. Although EPA indicates that PTW is only a "preference" for treatment, EPA's decision trees indicate that PTW is almost always subject to treatment including reactive armored caps, reactive residual cover layers after PTW is removed, in situ treatment, or ex situ treatment after removal and before disposal. Regarding ex situ treatment, EPA determines that any PTW that is based on NAPL (including trace observations per above) and PTW related to cPAHs or DDx must be ex situ treated. Essentially, the only situation where removed PTW does not need to be ex situ treated is for high concentration materials above the PCBs and dioxin/furan PTW thresholds. EPA's PTW approach contributes substantial ex situ and in situ treatment components to both removal and in-place technologies for all alternatives both inside and outside of SMAs, as well as extensive sheetpiles (and associated costs) for removal in some areas. For example, Alternative B involves ex situ treatment of 240,840 to 321,120 cubic yards (cy) of sediment, which is about 39% of the total volume removed under this alternative.[4] (Although EPA orally indicated on August 27 that much of this volume is due to RCRA hazardous waste determinations, this is not verifiable based on review of the information contained in EPA's cost appendix. See Comment 18 for more comments on RCRA hazardous waste determinations.) Per above, the PTW guidance does not support the need for treatment for all the materials falling within EPA's wide definition of PTW for this Site.

d. EPA is using extremely low dioxin/furan PRGs for PTW determinations that the LWG has previously commented are technically incorrect and not reflective of actual baseline risks (LWG 2014d, 2015a, 2015b). Also, as noted

[3] Also, this outcome is completely contrary to EPA's recent PTW determinations in the Lower Duwamish ROD as noted above.

[4] EPA's volumetric quantities vary inconsistently between different text and table locations. Consequently, this estimate is based on one set of values provided by EPA.

above for PCBs, EPA's dioxin and furan PTW levels are extremely low as compared to other common regulatory programs. For example, EPA's TCDD PTW level is 10 ng/kg in Table 3.2-1, while EPA's soil remedial goal for residential areas is 50 ng/kg.[5]

e. From a purely engineering perspective, it is not be necessary to conduct ex situ treatment of EPA-identified PTW before disposing of this material in a permitted landfill. The landfill acceptability criteria EPA discusses in Section 3 indicate that most of the PTW (as defined by EPA) would be reliably contained at the landfill without need for prior ex situ treatment (not just PCB and dioxin/furan PTW).

3. **Remedial Action Levels –** The LWG disagrees with EPA's dioxin/furan, TPAH, and DDx RALs for reasons discussed below. Also, the problematic absence of any evaluation of benthic risks as part of alternative development in Section 3 is discussed in Comment 3d.

   a. **Dioxin/Furan RALs –** The LWG does not agree that dioxin/furan RALs are necessary to define SMAs or select an effective remedy for the Site. EPA's Table 3.7-1 shows that the percent reduction in time-zero Surface-area Weighted Average Concentrations (SWACs) calculated by EPA for three dioxin congeners. The TCDD and PeCDD SWAC reductions for Alternative G are in the 60- to 70-percent range, which is a relatively low percent reduction as compared to the other RAL chemicals in the table. In contrast, the SWAC reduction for PeCDF starts at 89 percent for Alternative B and ends at 97 percent for Alternative G, which indicates that the range of RALs provides no meaningful differentiation in SWAC reduction for this congener. EPA has indicated (orally on August 27, 2015) that this is due to the paucity of data on detected dioxin/furan at the Site. However, the low data density and high non-detect frequency for the dioxin/furan dataset should be a reason to reconsider the value of dioxin/furan RALs, rather than a reason to explain the poor performance of such RALs.

   The insignificance of these SWAC reductions is more clearly illustrated by comparing the dioxin/furan SWACs achieved to EPA's own dioxin/furan PRGs by calculation of a SWAC exceedance factor—a factor above the PRG. This can be illustrated by comparing SWAC exceedance factors with and without EPA's proposed dioxin/furan RALs as shown in the tables below. The tables show that a RAL set that includes dioxin/furan RALs does not get the remedy meaningfully closer to acceptable risk levels as represented by EPA's PRGs. Details of this analysis can be provided. (EPA indicated orally on August 27, 2015, that EPA does not evaluate Site-wide SWACs, only SWACs on a rolling river mile basis. This is clearly incorrect given that the evaluation of each

[5] Per EPA's website (http://www.epa.gov/superfund/health/contaminants/dioxin/dioxinsoil.html): "For example, the PRG calculated using the new RfD of 0.7 pg/kg-day (picogram per kilogram-day) and EPA non-adjusted exposure factors would be 50 parts per trillion (ppt) toxicity equivalence (TEQ) for residential soil and 664 ppt TEQ for commercial/industrial soil."

alternative in Section 4 starts with a presentation of Site-wide time-zero SWACs. Also, EPA's own dioxin/furan PRGs are based on the osprey egg endpoint, which is assessed on a Site-wide spatial scale in the BERA. Thus, the Site-wide spatial scale is actually the most relevant scale for an analysis of dioxin/furan RALs.) For example, for PeCDD, Alternative F without dioxin/furan RALs achieves SWACs 310 times greater that EPA's PeCDD PRG, while adding the dioxin/furan RALs achieves SWACs for this same alternative that are still 256 times above the same PRG. (Also, conducting this evaluation on a rolling river mile basis would not change this conclusion. Specific rolling river miles would range much further above the PRG than this Site-wide assessment.) Similarly, the addition of the dioxin/furan RALs only slightly reduces the SWAC exceedance factors for PeCDF and TCDD across all alternatives, and none of the alternatives are estimated to achieve SWACs that are below those PRGs.

SWAC Exceedance Factor above the PRGs – without EPA's Dioxin/Furan RALs

Alternative	PeCDD	PeCDF	TCDD
B	409	2.3	9.4
C	407	2.3	9.4
D	401	2.3	9.3
E	360	1.8	6.7
F	310	1.7	6.0

SWAC Exceedance Factor above the PRGs – with EPA's Dioxin/Furan RALs

Alternative	PeCDD	PeCDF	TCDD
B	354	2.1	6.6
C	341	2.1	6.5
D	314	2.0	6.3
E	293	1.4	5.8
F	256	1.3	5.5

Also, for all of the dioxin/furan RALs EPA uses the exact same RAL numeric value to represent more than one alternative. For example, for TCDD, EPA proposes using the same RAL value of 0.002 µg/kg for Alternatives B, C, and D and the same RAL value of 0.0006 µg/kg for Alternative E, F, and G. This approach substantially constrains the alternatives from providing any meaningful changes in SWAC reduction or the SMA shapes and areas defined. Essentially, EPA is only providing three alternatives with regards to dioxin/furans. This appears to conflict with EPA's approach where the RALs (as opposed to technology assignments discussed in Comment 1) are the only real difference among alternatives. Thus, in the case of dioxin/furans, the alternatives have no variation in technology assignments and very little meaningful variation in term of RALs as well.

b. **TPAH RALs –** Per discussions at the 2014 FS technical meetings, the LWG disagrees that TPAH RALs should be used instead of cPAH RALs (expressed as BaPEq). BaPEq is consistent with the methods and results of the BHHRA, which were assessed in terms of total cancer risk from cPAHs on a BaPEq basis. Following the risk-based approach called for in the guidance,[6] RALs should be consistent with the methods and findings of the BLRAs to ensure that sediment remedies are "risk-based" (i.e., result in effective risk reduction). Further, EPA's latest Section 2 human health PAH PRGs are all expressed as BaPEq. Therefore, use of BaPEq RALs allows for a direct comparison on a consistent basis between the RALs and the PRGs, whereas TPAH RALs do not. Further, the use of BaPEq RALs for human health and Comprehensive Benthic Risk Areas (CBRAs)[7] for ecological risks addresses all of the PAH-related potentially unacceptable risks found in the BLRAs.

   Also, the BaPEq RALs should only be applied to human health exposure areas outside the navigation channel consistent with the risk-based approach called for in the guidance. The cPAH risks related to sediment direct contact and shellfish consumption exposures occur only outside the navigation channel (along the shoreline), and as a result, BaPEq RALs associated with these potential risks should be applied in these areas only. The only remaining human health potential unacceptable risk identified in the BHHRA was for the fish consumption scenario, which was determined using cPAH concentration data in fish tissue. There is no valid relationship between cPAH fish tissue and sediment concentrations at the Site, or any other sediments site, due to the rapid metabolism of PAHs by vertebrate fish (see LWG 2014d, 2015a, 2015b for additional details and references). Carcinogenic PAHs represent less than 1% of the cumulative risks to people eating fish and are, therefore, not a good reason to expand the remedy by hundreds of millions of dollars on the basis of a technically inappropriate PRG, given that there is no reasonable expectation that such an expansion could have any meaningful impact at all on the overall fish consumption risk. Because the BaPEq RALs can only be linked to effective risk reduction along the shoreline (using the BHHRA findings and the resulting appropriate PRGs for sediment direct contact and shellfish consumption), these RALs should only be applied along the shoreline outside of the navigation channel.

[6] EPA guidance (2005a) discusses "Risk Management Principles and Remedial Approaches" and clearly describes that the cleanup should use a "risk-based framework"; "select site-specific, project-specific, and sediment specific risk management approaches that will achieve risk-based goals"; and "ensure that sediment cleanup levels are clearly tied to risk management goals" (p. 1 – 5).

[7] See Comment 15 for more details on the LWG's position regarding benthic risk and EPA's removal of the CBRAs from the revised FS.

c. **DDx RALs –** Although the LWG agrees with the use of DDx RALs as a general concept[8] instead of individual DDD, DDE, and DDT RALs in the 2012 draft FS, the LWG disagrees with the upper end of the RAL curve selected by EPA. There is little differentiation in the areas mapped using EPA's B, C, and D RALs. For example, according to EPA's Table 3.3-4, within the RM 7W area, the acreages defined by EPA's DDx RALs for Alternatives B, C, and D are 10, 12, and 15 acres, respectively. EPA further indicates these RALs achieve Site-wide SWACs of 21, 20, and 19 ppb, respectively. Thus, this range of RALs represents virtually no substantial difference in areas remediated or risk reduction likely achieved. Instead, EPA should use DDx RALs of 8000, 1000, and 500 µg/kg for Alternatives B, C, and D, respectively. This RAL set would provide a wider differentiation between the active remediation acres and resulting SWACs achieved across these three alternatives. In addition, the LWG has the following specific concerns about EPA's DDx RAL analysis:

   i. Table 3.3-4 presents an inappropriate comparison of DDx RALs to a SWAC derived for a localized area of RM 6.6 to 7.8. EPA does not explain the basis for evaluating DDx across this area rather than an area that is consistent with the spatial scale evaluated in the BLRAs most related to appropriately calculated DDx PRGs. As noted above, RALs should be developed consistent with the BLRAs to be consistent with FS guidance.

   ii. The LWG's original position in 2011 was to use DDE RALs as a surrogate for DDD and DDT (and as a result, for total DDx). However, EPA expressed concerns in 2011 and again in 2014 FS technical discussions that the DDE RALs, by themselves, might not sufficiently bound areas of elevated DDD and DDT sediment concentrations. No supporting technical basis was provided by EPA for this concern, and none is provided in Sections 3 and 4. The determination of bounding COCs for RAL development is an evaluation that requires best professional judgment that must be clearly explained. In addition, the 2012 LWG draft FS indicates that potentially unacceptable risks associated with DDx are based only on the most conservative fish consumption pathway and are localized to RM 7, where DDx contributes only 3% of the cumulative potentially unacceptable risks. Given that EPA does not explain the reasons for the conversion from separate RALs to one combined set of DDx RALs, the LWG's proposal above may not fully resolve the LWG's concerns regarding EPA's DDx RAL approach.

d. **Comprehensive Benthic Risk Areas –** EPA makes no mention of the CBRAs in the FS Section 3 text or how those risks are addressed through the proposed RALs and SMAs. See Comments 15 and 17 for more information

[8] However, the LWG does not necessarily agree with how EPA made the conversion from separate RALs to a combined DDx RAL or with the EPA's DDx RAL values as noted further below in this comment.

regarding the LWG's position on benthic risk and need for consistency with the risk assessments.

e. EPA indicates in Section 3 that the RALs were selected using RAL curves and considering the zone of maximum incremental SWAC reduction, the zone of marginal incremental SWAC reduction, the knee of the curve, and spatial distribution of the RAL points on the curve. The LWG generally agrees with these RAL selection criteria, which are similar to those stated in the 2012 draft FS. However, a cursory review of the RAL curves presented indicates a wide difference in the RAL points chosen along these curves across the various chemicals. Considering the EPA stated selection criteria either individually or together, there is no discernable consistency in the RAL points selected on the curve for one chemical to the points on the curve selected for another chemical. Thus, the stated selection criteria do not appear to be followed.

4. **Inclusion of Riverbank Soils in the Sediment Remedy –** EPA's new approach for the riverbanks confounds existing and pending regulatory agreements between DEQ and upland PRPs regarding the evaluation and remediation of riverbanks. For example, the Evraz riverbank is being remediated this summer as a DEQ source control action, and the measure is generally consistent with the EPA revised FS approach. However, the Evraz riverbank is still included in the revised FS. DEQ is indicating at the Gasco and Arkema sites that the riverbanks still need to be included in the ongoing upland FSs, even though this would result in identification of likely different riverbank alternatives and remedies simultaneously under two different regulatory programs. Per past LWG comments on EPA's revised FS Sections 1 and 2 (LWG 2014d, 2015a, 2015b), the riverbank soils should remain part of the upland source control program directed by DEQ. This will allow the performing parties the necessary flexibility to integrate the riverbank and sediment remedies in a site-specific fashion that is not bound by broad FS-level assumptions.

   Further, the source control and remediation of riverbank soils needs to be integrated with any adjacent sediment remedy to be feasible and effective. This integration is typically very complex and needs to consider: the areas and depths of soil and sediment contamination, slope stability, slope layback, interactions with surface water runoff and groundwater discharge, potential interference with shoreline and upland structures, erosion protection, vegetation, habitat considerations, and shoreline regulations. EPA addresses this complexity across miles of Site shoreline with a very simplistic analysis and a few broad assumptions that are not well described. Thus, EPA cannot accomplish in the time available a reasonable integration of the riverbank source controls with the sediment remedy in the revised FS. Any riverbank source control not accomplished under DEQ should be integrated with the sediment remedy at the RD phase.

   Beyond the central issue that riverbanks should not be included in the FS at all, the LWG has the following specific concerns with EPA's FS approach for riverbank soils:

   a. EPA indicates, "Caps will likely need to be placed on much of these banks and volumes are estimated by assuming that all the banks are currently vertical and need to meet a minimum slope of 1.7H:1V." Clearly, most of the riverbanks are not nearly vertical, and some of them may currently have a shallower slope than 1.7H:1V. (The rationale for the very specific 1.7H:1V slope requirement, which equates to a nearly 60% slope is not explained.) Further, Section 3 goes on to present the alternatives with a different requirement: "In this alternative, 9,624 lineal feet of riverbank are assumed to be laid back to a slope of 5H:1V and covered with either an armored cap or an engineered cap using beach mix or vegetation." (The rationale for this slope is also not explained.) Consequently, it is unclear whether EPA is assuming slopes will be regraded to 1.7H:1V or 5H:1V or some combination of the two. If EPA is assuming a nearly 60% slope, the cap, backfill, and beach mix materials described in the Section 3 conceptual riverbank design are unlikely to stay in place without considerable additional engineering including potentially further lay back of that slope. Also, EPA does not describe in figures or text which portions of riverbank are included in each remedial alternative.

b. EPA does not present a schematic design that shows how these slope revisions are assumed to occur or are integrated with the adjacent sediment technologies. This raises many questions about the assumed approach, including integration of the slope (whichever slope is assumed) with the sediment technology assignments, where the slope starts and stops, and assumed elevation mark for distinguishing between sediment and riverbank technologies.

c. EPA has included some new DEQ data on riverbank soils contaminant concentrations in this analysis, but the details of those data additions have not been described by EPA, and no supporting database is available to better understand EPA's contaminant distribution decisions for riverbank soils. The RI and FS databases have very specific and detailed data quality and data usability criteria that take considerable time to address so that a consistent overall database is developed. It is unclear whether EPA considered these EPA-directed and long-established project protocols.

5. **Production Rates and Construction Durations –** EPA assumes aggressively fast production rates and construction durations and simultaneously directs numerous requirements for innovative dredge Best Management Practices (BMPs), precision dredging techniques, use of sheetpile barriers in some areas, a centralized transload and upland ex situ treatment facility (which will act as a process bottleneck), and a centralized upland water treatment system (which will also act as a bottleneck).[9] EPA also assumes that the remediation across the entire Site will be conducted as one overall seamless project from start to finish over periods of up to 18 years. Further, the original July 29 draft Section 3 provided insufficient information to determine the exact production rates assumed. EPA provided some additional text on August 14, 2015, that clarified the assumed production rates, but this text does not try to resolve the mismatch between the aggressive production rates and inherent delays caused by the other

[9] See Comment 5c for more discussion of bottlenecks.

extensive dredge requirements. Regardless, EPA estimates that the construction durations will be less than half the pace assumed for the 2012 draft FS (e.g., the Alternative F duration is 28 years in the draft FS and 12 years in EPA's revised FS Section 3, even though EPA also estimates substantially larger dredge volumes for the revised FS). Guidance is clear that the FS needs to fully evaluate the time and cost implications of any process options intended to reduce construction impacts, particularly those associated with unavoidable dredge releases. EPA (2005a) indicates, "Project managers should be aware that most engineering measures implemented to reduce resuspension also reduce dredging efficiency. Estimates of production rates, cost, and project time frame should take these measures into account."

a. Per past LWG comments (LWG 2014e), the LWG disagrees with many of EPA's production rate assumptions and the applicability of data from other dissimilar sites used to support those production rates. In addition, much of EPA's accelerated schedule seems to be driven by assuming that construction will take place for 24 hours per day, rather than 12 hours per day, which was the 2012 draft FS assumption. EPA notes in Section 3, "The daily and weekly durations of removal operations may be refined if community 'quality of life' concerns (such as night-time noise or light pollution) are identified." If these operations are refined to exclude dredging at night, all of EPA's alternative durations will extend out by approximately a factor of two. In the Lower Duwamish Waterway FS, a combination of 12- and 24-hour days were examined (see details below in Comment 5c). Also, the Duwamish early action projects so far have proceeded mostly on a 12-hour/day work schedule, or if they have included longer durations (e.g., the Boeing project work extended up to 20 hours per day), much of this time is not actually spent actively dredging (see Comment 5c). The Lower Duwamish Waterway appears to have less residential neighborhoods within close distance of the remediation area as compared to Portland Harbor, and yet EPA is assuming that there will be fewer quality of life concerns associated with around the clock dredging in Portland Harbor.

   Also, numerous upland support activities beyond just the dredging and capping itself may have a larger impact on the community, particularly at night. It is noteworthy that EPA's Section 4 cost estimate assumes that trucks will transport materials from the transload facility to off-site landfills. For all the alternatives, this represents a huge increase in the amount of local truck traffic through local neighborhoods, with half of that traffic occurring at night. These disturbances would be in addition to traffic bringing equipment, personnel, and materials to the Site for building and operation of the transload and water treatment facilities. Operation of the transload and water treatment facilities would also involve upland noise and light impacts, which are issues that have previously been a concern in the community (e.g., beeping alert sounds from facility vehicles and facility safety lighting).

b. The 24-hours-a-day/6-days-a-week assumption significantly hampers the contractor's makeup time when weather, equipment downtime, adjustments to

BMPs, or other delays slow planned production rates especially on long projects with limited construction windows. Therefore, EPA's aggressive work schedule assumption does not match how that work will likely proceed.

c. EPA does not discuss or appear to include any time for preparation of dredging areas (e.g., placement and removal of silt curtains, and particularly, sheet pile walls), moving operations from one dredge area to another (e.g., stepping time), and placement of materials (EMNR layers, capping materials, backfill, etc.). The Lower Duwamish FS considered many of these additional factors and used a 60% efficiency rate (i.e., dredging only takes place during 60% of the daily construction period). The Duwamish FS also considered days off for holidays, downtime to accommodate associated construction like piling and dock work, weather and other delay days, and a period at the end of each construction window without dredging activity to allow for time to place capping, backfill, and EMNR materials. EPA's FS text addresses none of these issues.

   In addition, EPA does not clearly address the potential effects of process bottlenecks at transload, ex situ treatment, or water treatment facilities. EPA indicated in supplemental production rate text that bottlenecks can be avoided by building very large facilities. However, the implementability issues created by finding and developing very large shoreline properties for this purpose are not discussed in Section 3. Further, the Section 4 cost estimates do not appear to include any water treatment costs and only some aspects of the costs associated with developing a very large transload facility (i.e., EPA assumed 140-acre facility but did not fully cost it). It is entirely unclear to what extent such a large transload facility can be realistically identified and developed considering the current availability of suitable shoreline properties. Under any scenario, the siting and development of sediment and water staging, handling, treatment, and transloading facilities could easily be a multi-year process, which does not appear to be accounted for in EPA's duration estimates.

6. **Volumes –** EPA uses a very simplistic approach to estimating dredge volumes, which has a large potential to substantially underestimate the dredge volumes eventually determined in RD. It is possible that this one issue, by itself, would lead to cost estimates outside the guidance prescribed +50 to -30% range (EPA 2000). However, when added to other issues of inconsistencies and errors noted in Section 3 (see Comment 19 below), EPA's simplistic volume estimating approach could substantially contribute to development of costs well outside this prescribed range. EPA indicates that it used maps contoured using core data, and assigned the depth to the applicable RAL for each 10-foot by 10-foot grid cell on the map. EPA then assumes that each grid cell is removed to this depth in a cookie-cutter fashion with a 1-foot overdredge allowance. EPA calls this the "neat" volume. Unlike the 2012 draft FS, EPA did not determine FS-level dredge prisms. These prisms typically incorporate stable slope assumptions, offsets from structures,

integration with adjacent technologies, and a residual "cleanup" pass depth.[10] EPA's volumes also do not consider engineering factors addressing the uncertainty in FS-level volume estimates as compared to design-level estimates (e.g., allowance for new inventory discovered during design sampling, design-level prisms, and transition slopes from deep to shallow dredge cuts). EPA instead uses general factors of 1.5 and 2 times their calculated neat volume to address all these issues. The result is a very approximate volume estimate and likely a substantial underestimate of future design volumes.

7. **Lack of Integrated Designs –** As described for the technology assignments Comment 1 above, EPA uses a series of broad assumptions or rules to assign the base technologies (i.e., dredging, capping, enhanced monitored natural recovery [EMNR]). EPA also adds numerous process option rules to many of the base technologies that are described by EPA in various subsections to address a variety of other issues not directly related to sediment remediation (e.g., habitat mitigation, flooding concerns, and concerns about the creation of "new land"). In contrast, the 2012 draft FS addressed each issue separately to determine the potential overall effect on remedy costs, without defining specific assumptions on how those issues would be integrated into the overall design. For example, the 2012 draft FS calculates overall habitat mitigation credits and debits for each alternative and assigns overall costs that will compensate for any net debits for each alternative based on data from past habitat mitigation projects. This approach avoids assuming that the mitigation must be constructed and integrated into the remedial design in a specific prescribed way as EPA does in the revised FS. In Section 3, EPA presents broad rules that include:

   - Avoiding "creating new land" in shallow water areas by pre-dredging prior to any cap placement
   - Addressing "habitat mitigation" by filling dredge prisms to pre-existing elevations, laying back riverbank slopes to 5H:1V, and using "beach mix covers" at the surface of some dredge backfills and caps
   - Addressing "flood issues" by pre-dredging cap areas to create a localized balance of fill and cut
   - Addressing dredge residuals (e.g., post-dredge covers)

   The LWG previously commented (LWG 2014f) that the EPA additional rules:

   - Will not accurately reflect future decisions made in RD and that these topics should be determined in design on a site-specific basis
   - Are not able to provide an FS-level integration of alternative features that consistently addresses habitat mitigation, water surface area loss, navigation needs, flood concerns, and dredge residuals control simultaneously
   - Do not account for an allowance for potential future maintenance dredging, potential future deepening, allowable overdredge, and operational buffers such

[10] Although EPA mentions elsewhere that one residual cleanup pass is assumed for dredging operations in general, this is not mentioned in the paragraph describing the volume calculations.

that any caps or covers placed in navigational areas would not be subsequently impacted by navigation or removed by future maintenance dredging.

In fact, some of the rules presented by EPA actually exacerbate one issue while attempting to address another. For example, EPA's rule to fill dredge prisms in an attempt to simply address mitigation issues exacerbates flooding issues by reducing the river hydraulic cross section that would be created by dredging in the first place. Instead EPA should be evaluating the alternatives comprehensively for their potential impact on flood rise using appropriate flood models, such as the HEC-RAS model that EPA required the LWG use and present in the 2012 draft FS. This information should then be used to determine whether any additional flood mitigation costs should generally be added to the alternatives. The EPA-required 2012 draft FS flood modeling found that none of the draft FS alternatives (even those containing substantial capping and CDF facilities) caused substantial rises in flood elevations. Additional examples of the contradictory nature of some of EPA's preliminary rules are provided in past LWG comments (LWG 2014f).

Beyond the LWG's past comments, the EPA Section 3 process option rules create some new LWG concerns including the following:

a. Dredging and then capping back in shallow areas will often reveal higher concentrations of subsurface contaminants, which are then capped. This potentially creates a need for a more robust cap as compared to simply capping lower concentration surface contamination in the first place. Whether dredging and capping back can cost effectively be used to balance flood or creation of "new land" concerns, as compared to designing an overall remedy that balances cut and fill elsewhere, is more easily and cost-effectively addressed in RD.

b. EPA often places backfill, sand, beach mix, and activated carbon in various navigational, intermediate, and shallow sediment areas. EPA pays close attention to erosion concerns for caps in the technology assignment scoring matrix, particularly in shallow areas subject to wave action, but these additional process options are assumed with no apparent consideration of the potential for these materials to stay in place. Placing 6 inches of sand cover after dredging is a standard practice, which accounts for some portion of the material being redistributed across or outside the dredge area. However, EPA appears to make similar assumptions about in situ treatment layers and post-dredge covers incorporating activated carbon. These are considerably more expensive to place and then provide no benefit if subsequently lost through erosion. This is another aspect of how EPA's technology assignments do not accurately predict determinations that will be made in RD using appropriate engineering assessments.

c. It is unclear how the mitigation costs developed in the mitigation appendix (Appendix J) are consistent with the mitigation process option rules that EPA added to the technology assignments (e.g., backfill and beach mix additions). That appendix describes a simplistic approach that assumes that each acre impacted by an alternative provides full habitat function and that the function is completely lost due to the dredging or capping activity. Thus, the presumed habitat benefits associated with some of these process option rules are completely unaccounted for in EPA's mitigation cost analysis. EPA is adding costly options to the alternatives to improve habitat and then simultaneously assuming the addition of those options has no benefit in reducing habitat mitigation costs. This calls into question how these habitat-based process option rules provide any benefit to the revised FS or improve the habitat features of the alternatives developed. Comment 16d discusses the mitigation costing issues in more detail.

8. **Discussion and Analysis of Monitored Natural Recovery Is Biased –** The MNR evaluation includes text scattered across Sections 3 and 4. The overall MNR evaluation presented across these two sections is very limited and technically inappropriate in many respects. Overall, EPA suggests that MNR is potentially appropriate for the Site with many caveats and doubts expressed in that assessment. In actual fact, the case for MNR at the Site is strong given that there are multiple lines of evidence supporting the ongoing occurrence of MNR well in excess of the lines of evidence presented by EPA. The simplistic MNR analysis in Sections 3 and 4, appears to cast doubt on the validity of MNR as a potentially feasible process for the Site, which is a misleading representation of the data.

   In Section 3, EPA presents a very simplistic MNR analysis, which generally assumes that MNR will take place outside any active remediation areas based on: 1) surface to subsurface sediment concentration ratios; and 2) a simple deposition rate calculation using two of the time series bathymetry datasets. In Section 4, EPA slightly expands upon the evaluation of MNR, including a different analysis of the time series bathymetry, a brief discussion of maintenance dredging history as an indication of deposition, and a perfunctory discussion of the 2012 smallmouth fish tissue PCB data. Generally, it is unclear why there are two separate and somewhat conflicting MNR evaluations spread across these two sections, particularly given that neither section references the other.

   EPA's analysis does not include the full lines of evidence strongly supporting the presence of ongoing natural recovery at the Site. The LWG has provided this information in past submittals to EPA including the 2012 draft FS, a detailed presentation of smallmouth bass fish tissue concentrations (Anchor QEA 2013), and estimated equilibrium levels for the Site (LWG 2014d, 2014g). In summary, the lines of evidence for ongoing natural recovery at the Site are:

   - Sources are being progressively controlled. DEQ's latest source control report (DEQ 2014) indicates DEQ has completed source control evaluations and implemented (or will implement) controls on one or more potential pathways at approximately 119 of 168 sites examined in detail to date.
   - The aggregate information from five multi-beam surveys indicates widespread deposition of sediments across many areas of the Site. Although EPA emphasizes the uncertainties of the data, for reasons detailed below, the LWG disagrees these data present substantial uncertainties about deposition.

- Sediment trap and suspended sediment data clearly show that incoming settling sediment has substantially lower contaminant concentrations than most of the Site bedded sediment, which will drive bedded sediment concentrations lower over time.
- Radio-isotope coring data, although limited, indicates deposition rates consistent with other measures such as the bathymetry time series.
- Site surface sediment grain sizes are fine-grained across the majority of the Site, strongly indicating a long term depositional environment exists in these areas.
- Surface to subsurface sediment concentration ratios in most areas of the Site indicate newer surface strata contain lower concentrations than older subsurface strata, which illustrates that surface sediment concentrations are decreasing over time.
- Surface sediment concentrations measured over time (i.e., time series) indicate surface sediments have decreasing contaminant concentrations. The 2012 draft FS data are somewhat limited, but new PCB data collected in 2014 by other parties may provide additional useful information for this line of evidence.
- Smallmouth bass PCB tissue measurements made in 2002, 2007, and 2012 indicate statistically significant declines in tissue concentrations across almost all areas of the Site (Anchor QEA 2013). Differences in sampling and compositing schemes across the years can be controlled to determine statistically valid results.
- Comparisons of sediment profile images collected in 2001 (by the LWG) and 2013 (by other parties) indicate that much of the Site now has well established Stage 3 benthic communities indicative of stable and recovering substrates.
- Simple modeling (such as EPA's SEDCAM modeling, which was not provided in Section 3 or 4) and complex modeling (such as the 2012 draft FS QEA FATE model and coupled dynamic Food Web Model) all generally indicate recovery of surface sediments over a reasonable timeframe toward a relatively consistent range of potential equilibrium levels.

Specific issues relevant to the EPA Section 3 and 4 MNR evaluations include:

a. In Section 3, EPA's MNR text starts by discussing that MNR is not usually selected as a "stand-alone" technology per guidance. Although this is consistent with guidance, neither the LWG nor EPA proposes to use MNR as a stand-alone remedy. The Section 3 text then goes on to list a series of cautions and conditions about MNR in bullet points, apparently intended to support the opening contention that MNR is not a good stand-alone remedy. Further, some of the conditions noted in the bullet points as conducive to natural recovery are actually present or strongly indicated in Portland Harbor. Therefore, the purpose of this discussion in light of EPA's selection of MNR as a component of all alternatives is unclear and should not be relied upon to undermine the substantial evidence supporting MNR as a major component of the overall remedy.

b. EPA's Section 3 discussion of surface to subsurface sediment chemical concentration ratios within the Site is misleading. For example, EPA uses a surface to subsurface ratio of 0.5 (which is more conservative) to indicate likely MNR, whereas the 2012 draft FS uses a ratio of 0.67. EPA does not discuss the rationale for the selection of this more conservative ratio, or why it leads to any more valid conclusions about natural recovery at the Site.

c. EPA's Section 3 discussion of deposition rates within the Site is misleading. EPA appears to have ignored the LWG's comments in October 2014 where the LWG described differences in the definition of areas that are "reliably depositional." EPA continues to use the "typical bathymetric survey measurement error" of 6 inches or 15 cm (which equates to 2.5 cm per year (cm/yr) over the period of 2002 to 2009) to define areas that are reliably depositional. Measurement error in a bathymetric survey is a random error (i.e., there is no bias) with an average value of 0 cm for many measurements. These data are normally distributed, so that a 15-cm measurement error is a very rare occurrence (e.g., at the 3-sigma level, which has a probability of occurrence of less than 1% for a single measurement). Thus, EPA's use of a +15-cm measurement error at a single location (10-foot grid) to specify the 2.5 cm/yr deposition threshold is extremely conservative. Further, evaluating and interpreting bed elevation changes on a 10-foot grid is not appropriate due to inherent measurement uncertainty at this small spatial scale. Averaging bathymetry data over larger spatial scales provides a more reliable method for analyzing bed elevation changes because the effects of measurement error on the results decrease as the spatial scale increases. This approach was used by LWG in the 2012 draft FS to analyze bed elevation changes over a wide range of spatial scales in the Lower Willamette River.

   The uncertainty in EPA's analysis results can be significantly reduced simply by averaging the bathymetry data over slightly larger spatial scales. For example:

   i. Using a 20-foot grid (i.e., averaging of four data points from the 10-foot grid) would reduce the measurement uncertainty by a factor of 2 (i.e., +7.5 cm), which would reduce the deposition threshold to 1.25 cm/yr.

   ii. Using a 30-foot grid (i.e., averaging of nine data points from the 10-foot grid) would reduce the measurement uncertainty by approximately a factor of 3 (i.e., +5 cm), which would reduce the deposition threshold to about 1 cm/yr.

   Thus, using the data over appropriate spatial scales, it can be reliably determined that areas experiencing more than 7.5 cm of deposition over the 6-year period between 2003 and 2009 are depositional (equating to 1.25 cm/yr). This difference between EPA and LWG's approach results in a large change in the amount of Site area characterized as reliably depositional (the LWG method results in 63%; the EPA method results in 47%).

DO NOT QUOTE OR CITE This document is currently under review by US EPA and its federal, state and tribal partners and is subject to change in whole or in part.

d. In Section 4, EPA uses a different approach that biases results when evaluating temporal changes in bathymetry data between 2002 and 2009 and is inconsistent with recent Sediment Erosion and Deposition Assessment (SEDA) guidance (Hayter et al. 2014). EPA concluded that "many areas of the site are in dynamic equilibrium" and "for many areas of the site, the determination of deposition, and the assertion that burial is a viable long-term recovery mechanism, is highly dependent on which survey pair is selected." Generally, temporal changes in the Lower Willamette River (LWR) bathymetry (and similar river systems) are dynamic, with alternating periods of gross deposition and erosion occurring in localized areas. The bathymetry data clearly show that net deposition occurs over large portions of the LWR during the overall multi-year period (e.g., 2002 to 2009) examined as discussed in Comment 8c above. The net deposition process during a multi-year period does not typically correspond to steady continuous deposition; net deposition is due to a cumulative increase in bed elevation that results from alternating periods of deposition and erosion, with gross deposition being greater than gross erosion over a long period. This is not a surprising or unusual finding for this or similar river systems. Consequently, EPA's emphasis on comparisons between various individual pairs of bathymetry surveys ignores the overall trends represented by the bathymetry series as a whole. The FS is also misleading regarding the uncertainty of this information, given these dynamic sedimentation processes are routinely evaluated at sediment remediation sites using time series bathymetry data. Such routine methods are used in the 2012 draft FS and are consistent with the most recent guidance (Hayter et al. 2014). EPA does not reference this guidance in the Section 3 or 4 bathymetry discussions.

e. In Section 4, EPA devotes one paragraph to a discussion of the 2012 smallmouth bass tissue PCB data. EPA indicates that an "exact comparison" between 2002, 2007, and 2012 smallmouth bass tissue data is not possible because the "sampling and compositing schemes vary between years." The LWG provided a detailed presentation to EPA in March of 2013 comparing the tissue data across these years, including several types of statistical tests and other trend comparisons (Anchor QEA 2013). That LWG presentation showed that, in many respects, the differences in sampling and compositing across sample years can be controlled to obtain statistically meaningful information regarding clear declines in fish tissue PCB concentrations. EPA included in Section 4 the single most simplistic graph from the start of the LWG's presentation, which was intended to merely summarize the data that are available, not demonstrate observed declines. EPA concludes from this one misused graph that the data are only "suggestive of declines." The text ignores all of the other detailed information and graphs available that more clearly show the tissue PCB declines, and EPA ignores all of the statistical analysis provided by the LWG. Consequently, EPA substantially understates the role of these data as a strong line of evidence for the effectiveness of MNR at the Site.

9. **Dredge Releases Only Qualitatively Evaluated –** EPA discusses dredge release issues in several paragraphs in Section 3 and evaluates them qualitatively in the Section 4, but neither Sections 3 nor 4 contain any quantitative assessment of potential dredge releases associated with the alternatives. Dredging releases are a well-recognized issue related to the short-term effectiveness of sediment removal that increases both human health and ecological risks. It is one of the main contributors to construction phase environmental impacts, particularly for alternatives that involve substantial dredging, such as those proposed by EPA. Per guidance (EPA 2005a), a comprehensive and quantitative evaluation of those impacts is required:

   - “Generally, the project manager should assess all causes of resuspension and realistically predict likely contaminant releases during a dredging operation.”
   - “To the extent possible, the project manager should estimate total dredging losses on a site-specific basis and consider them in the comparison of alternatives during the feasibility study.”
   - “Dredging residuals have been underestimated at some sites, even when obvious complicating factors are not present.”
   - “Project managers should be aware that most engineering measures implemented to reduce resuspension also reduce dredging efficiency. Estimates of production rates, cost, and project time frame should take these measures into account.”
   - “The strategy for the project manager should be to minimize the resuspension levels generated by any specific dredge type, while also ensuring that the project can be implemented in a reasonable time frame.”

   The LWG disagrees with several aspects of EPA’s limited analysis of dredge releases.

   a. EPA uses limited qualitative evaluations of the range of release rates that can be expected for typical environmental dredging projects and the role of post-residual covers in reducing release rates. In a memorandum provided in 2013 (which are not cited in the revised FS) EPA relies on two recent projects (Lower Duwamish Boeing Plant 2 Early Action Area dredging and the Hudson River Phase 2 dredging) to support the contention that 1 percent overall releases are likely across Portland Harbor. The 1 percent release rate for the Boeing project is not supportable from the actual project data. EPA ignores the six case studies presented in Table 6.2-12 of the 2012 draft FS constructed from 2004 to 2009, all of which are based on detailed site specific data collection as summarized in the table. Thus, EPA is establishing a 1-percent release rate based on one project (Hudson River Phase 2) that appears to be one of the lowest release rates documented to date. Further, EPA is applying this optimistic release rate from a site that is entirely different both chemically and physically from the Portland Harbor Site, which includes 10 river miles of highly varying physical and chemical conditions. The 2012 draft FS provides summaries of six case studies from within the last 10 years with observed average total release rates in the 3% range, and the LWG still believes this is a more realistic assumption for the revised FS. More details supporting the LWG's disagreements on this subject can be provided.

b. EPA describes on page 3-19 relatively detailed requirements for determining dredge completion and post-dredge sampling of the residuals, which in this particular case appears far too detailed for an FS-level discussion and does not appear to help determine the characteristics of the alternatives presented in Section 3. As described under Comment 1, EPA should leave such specific determinations to a performance-based ROD approach supported by a site-specific engineering assessment in RD.

10. **Perfunctory Alternative Screening –** EPA devotes one page of qualitative text to the alternative screening process. Effectiveness, implementability, and cost of Alternatives B through G are briefly discussed. This analysis is insufficient to screen and identify the alternatives that should receive detailed evaluation in Section 4.

    a. For effectiveness, EPA estimates the time-zero SWACs for each alternative immediately after construction by assuming all actively remediated areas achieve a post-construction concentration of zero. However, EPA does not consider whether these SWACs represent a meaningful reduction in sediment relative to unacceptable risk levels or background or equilibrium conditions. Although a full residual risk assessment is not necessary at a screening level, some comparison to risk levels such as appropriately calculated PRGs would provide for a more reliable screening of the alternatives. Further, EPA does not discuss the fact that SWACs immediately after construction are not a good measure of the long-term outcomes for the alternatives or the qualitative similarities and differences in the expected or estimated long-term outcomes of the alternatives (see Comment 14 for more details). EPA further implies that alternatives that rely more on MNR are potentially less effective, although the guidance (EPA 2005a) is clear that there is no presumptive preference for one type of remedial technology or another; rather, the goal is risk reduction.

    b. For implementability, EPA discusses in one sentence that more construction is involved as the alternatives progress from B to G. There is not any actual discussion of the implementability issues involved with any of the alternatives. Using Alternative G as an example, EPA does not discuss the obvious implementability issues associated with such large sediment remediation projects including:

        i. Precision dredging involving 6 to 9 million cy of sediment over 18 years[11] with multiple water quality BMPs and requirements

        ii. Construction on a continuous 24-hours-a-day/6-days-a-week schedule for the entire multi-year project with no allowable time for related construction operations (e.g., the efficiency rate discussed above)

        iii. Import of 2.3 million cy capping and cover material[12]

[11] This is EPA's estimate. Based on the discussion in the durations issue above, we would approximately estimate the time to complete Alternative G at more like 36 years (approximately twice as long as EPA's estimate).

DO NOT QUOTE OR CITE This document is currently under review by US EPA and its federal, state and tribal partners and is subject to change in whole or in part.

iv. Installation and removal of large areas of sheetpile or coffer dams partially obstructing the navigation channel[13]

v. Ex situ treatment of a significant percentage of the dredged material using thermal desorption, which has never been applied to a sediments project of this size

vi. Institution of permanent regulated navigation areas for 236 acres of caps (11% of the Site)

vii. Building a water treatment plant that will operate for nearly the entire construction period

viii. Finding a 140-acre shoreline property nearby and developing it into a large transload facility

Further, there are significant equipment and contracting issues associated with executing multi-year projects where tens of millions of dollars of equipment need to be mobilized to the Site. Also, this equipment will need to stand idle (or perhaps in a few instances be moved temporarily to coincidentally available nearby construction efforts) for two thirds of each year while the construction window is closed.

c. No cost estimates are presented in Section 3. Costs are typically part of the alternative development process and are one of the characteristics that help describe and compare the alternatives for screening purposes. EPA mentions that costs are expected to increase as the alternative size increases, but this gives no sense of the relative magnitude of the costs across the alternatives (i.e., based on the discussion, it is unclear whether Alternative G is twice as expensive as Alternative B or ten times as expensive).

d. The only alternative screened out in EPA's qualitative screening discussion is Alternative C. EPA's rationale is that between Alternatives B and C there is a small incremental increase in quantities of dredge and borrow materials and a small incremental decrease in the time-zero SWACs estimated for immediately after construction. This logic is unclear. A better common sense measure of effectiveness for unit effort would be to examine alternatives that involve a large incremental increase in active remediation acres while obtaining a small decrease in the SWACs achieved. The table below uses such an approach and compares the incremental change in active remediation

[12] This may not include dredge prism backfill material volumes due to the lack of detail in EPA's estimates.

[13] EPA indicates that sheetpile walls will be constructed in two select areas regardless of water depth, which would result in sheetpiles at least partially inside the navigation channel. But EPA provided no schematic to determine the proposed sheetpile locations. Also, cofferdams or king piles would likely need to be used in water depths in excess of 40 feet, or perhaps even less.

acres and the additional PCB SWAC reduction achieved by moving to each successively larger alternative. This is summarized in the last column as number of active remediation acres required to achieve each percent of SWAC reduction. For example, for Alternative C, an additional 5 acres must be remediated to obtain a 1 percent change in the SWAC. Conversely, for Alternative G an additional 40 acres of active remediation is needed to achieve a 1 percent SWAC reduction. By this more straight-forward measure, Alternative C represents a very effective incremental decrease in time-zero SWACs. As a result, EPA should screen out Alternative G (and possibly Alternative F) and retain Alternative C.

Alternative	PCB SWAC Percent Decrease between Alternatives	Alternative Active Remediation Acreage	Added Acres between Alternatives	Number of Acres Added for Each Percent of SWAC Reduction
B	58	212	212	4
C	4	233	21	5
D	7	286	53	8
E	10	362	76	8
F	12	588	226	19
G	7	868	280	40

11. **Use of Sheetpiles and Other BMPs –** EPA's approach for the assumed construction and use of sheetpile barrier walls as dredge water quality control measures is not explained in EPA's text or appendices. The 2012 draft FS presents considerable information and case studies supporting the contention that sheetpile walls are generally not a cost-effective means of minimizing dredge releases (i.e., they are both expensive and are not water-tight barriers that eliminate dredge releases as is often assumed). Also, the relative cost benefit of using sheetpiles is not discussed or evaluated. The following minimum description of the sheetpile approach would be needed in order to understand the feasibility and costs of this requirement:

    - An approximate schematic showing the area enclosed and the assumed height of the sheetpiles. This would also show whether and to what extent EPA is proposing partial obstruction of the navigation channel with deep water sheetpiling.
    - A description of the type of sheetpiling proposed, particularly given that unsupported sheetpiles will not be constructible in water in excess of 40 feet deep (perhaps shallower). This will require king piles or coffer dams, which are more expensive to obtain, install, and remove.
    - EPA indicates that NAPL areas would be enclosed by sheetpile, but given that some NAPL areas may be capped (if we understand EPA's technology assignment approach correctly), it is unclear which areas would be enclosed and which would not.

- At least some analysis of the incremental benefits that could be expected (if any) relative to the cost of adding sheet pile walls to certain dredging locations.

In addition, the sheetpiling costs used in the cost appendix underestimate the costs of cofferdams, which would appear necessary in some of the water depths and bedded sediment conditions identified by EPA. The revised FS contains no provisions for the extensive bracing/anchoring that would be required to address hydraulic forces and/or restricted embedment depths where bedrock is present.

Similar to the technology assignment (Comment 1) and integrated design (Comment 7) issues, general rules and assumptions for sheet piles, coffer dams, and other water quality BMPs (such as silt curtains) should only be used to support FS-level evaluations. Such FS-level assumptions should not be used as requirements for eventual construction BMPs that are best determined through detailed evaluations that will be necessary during remedial design. Design level water quality BMPs should be determined using a performance-based requirements in the ROD and using engineering assessments in RD (i.e., the performance goal should be to meet the water quality standards consistent with the substantive requirements of water quality ARARs).

12. **CDF Acceptance Criteria and Related Issues –** EPA has changed some of the CDF acceptance criteria and performance standards (Table 3.3-8) since the T4 CDF 60% design, even though EPA references that design as the source of the criteria and standards. The LWG disagrees with many of these changes, particularly because no rationale is provided for why the changes make the remedy more protective or effective. Although every instance of potential LWG disagreements with EPA's new CDF text is not noted here, the LWG disagrees with the following major EPA changes:

    a. EPA indicates that "Sediments that would designate as RCRA or State hazardous waste, whether listed waste or characteristic waste are not eligible for placement in the CDF." However, the T4 CDF 60% design criterion includes the words "without adequate treatment." This is an important distinction that may allow a considerable volume of treated materials to be placed in the CDF. Similarly, EPA unacceptably excludes the "without adequate treatment" clause in the "No Free Oil" criterion.

    b. EPA adds a new criterion regarding the "Waste or Contaminated Media Warranting Additional Management," which EPA defines elsewhere in Section 3 as manufactured gas plant (MGP) related materials that fail the TCLP test for one or more chemicals. As noted above, material that is treated to pass the TCLP test should be acceptable for placement in the CDF to be consistent with the T4 CDF 60% design criteria.

    c. EPA added the words "NAPL" to the "no free oil" criteria from the T4 60% design. As noted above, elsewhere in Section 3, EPA defines NAPL as any instance of oil (e.g., blebs and globules) and including instances of solid tar found at Gasco. Consequently, EPA has revised the T4 CDF 60% design "no free oil" criterion to now exclude a much broader range of contaminated sediments than was originally intended for the T4 CDF design. EPA provides no rationale for why these additional materials could not be effectively disposed of in a CDF.

d. Table 3.3-8 contains text that "alternative standards may be developed during remedial design." This new language causes a great deal of uncertainty regarding potential construction of a CDF moving forward into design. It is unclear why EPA is no longer willing to support the T4 CDF performance standards that were defined through extensive deliberations on that project.

e. Figure 3.3-40 indicates that PTW that is not reliably contained must be disposed of at an upland landfill. The figure also indicates that reliably containable PTW[14] must be treated before placement in a CDF. Thus, EPA appears to use the PTW designation, which guidance intends solely to assist in a "preference for treatment" assessment, to determine whether material can be effectively contained in a CDF. It is inappropriate for EPA to use information related to in situ toxicity of the sediments and/or an in situ model (i.e., EPA's "super cap" modeling, which assumes in situ contaminated sediment conditions and groundwater movement) to determine whether those sediments can be reliably contained in a different CDF location with entirely different groundwater flow conditions and containment design. A CDF-specific long-term groundwater transport model that describes the CDF design and surrounding environmental conditions must be used to determine sediments that can be effectively contained within that CDF. Such a CDF model was used and extensively reviewed by EPA during the T4 CDF 60% design development. That modeling determined that sediments from ten Site areas with relatively higher contaminant concentrations were suitable for placement in the T4 CDF.

f. The Figure 3.3-40 flow chart appears to expand the restrictions for material eligible for the T4 CDF and is inconsistent with Section 3.3.5.1. Section 3.3.5.1 states the following (page 3-23):

> "Dredged material subject to requirements of a permit that has been issued under Section 404 of the CWA is excluded from the definition of hazardous waste [40 CFR 261.4(g)]. This provision is discussed in the Hazardous Waste Identification Rule (HWIR) (63 FR 65874, 65921; November 30, 1998). Oregon State adopted the HWIR rule in 2003. This rule means that RCRA regulatory requirements do not apply to sediment dredged at the Portland Harbor Site and disposed of on-site, such as at the Terminal 4 CDF, if the material otherwise meets the CDF acceptance criteria."

RCRA regulatory requirements do not apply to sediment that is dredged from the Portland Harbor site and placed on site in a CDF. Similarly, DEQ indicated during the Arkema EE/CA discussions that the state follows the RCRA HWIR. Consequently, dredged sediments containing DDx or other

[14] Per Comment 2, the LWG disagrees that reliably containable material meets the PTW definition at all.

pesticides could also be placed in a CDF, even if it would otherwise be determined to be a state hazardous waste per the Oregon Pesticide Residue Rule.

13. **Incomplete Evaluation of Alternatives –** EPA indicates that the evaluation of alternatives in Section 4 is “qualitative” in some respects. In fact, the evaluation is almost entirely qualitative, and most results and conclusions about the performance of the various alternatives against the FS evaluation criteria are presented as a series of subjective statements. This approach is in stark contrast to the LWG’s 2012 draft FS, which contained quantitative and detailed data analyses supporting alternative evaluation methods and results. To illustrate EPA’s subjective approach, Table 2, below, provides a comparison of EPA’s revised FS Section 4 methods to those used in the 2012 draft FS, often as required by EPA at the time, for each of the seven FS alternatives evaluation criteria.

    EPA summarizes the eight page comparative analysis at the end of Section 4 in Table 4.3-1 by merely condensing the qualitative and subjective statements from the text. This information is further summarized in a dot chart in Table 4.3-2 with the same title as the title of Table 4.3-1, “Summary of Comparative Analysis of Alternatives.” Neither the text nor the resulting summary tables address key central questions relevant to the appropriate evaluation of the alternatives against the FS criteria, such as:

    - How does EPA determine that all the alternatives are protective given that EPA’s time-zero SWAC analysis indicates that none of the alternatives achieves all of the sediment Remedial Action Objectives (RAOs) and related sediment PRGs? Also, the Section 4 text fails to explain that MNR is not expected to achieve acceptable risk levels indicated by the Section 2 RAOs because, in many cases, those risk levels are below background or equilibrium levels expected for the Site.[15] Therefore, what is the role of background in achieving RAOs and protectiveness in general?
    - How does EPA determine that all alternatives comply with Applicable or Relevant and Appropriate Requirements (ARARs), given that some surface water quality ARARs are not met in upstream river water? What is the role of ARAR waivers in EPA’s determination that ARARs will be met?
    - How does EPA determine the relative long-term effectiveness of the alternatives, given that EPA makes only short-term estimates of sediment concentrations (i.e., time-zero SWACs)? Time-zero SWAC-based risk metrics used by EPA to evaluate and compare alternatives against RAOs 1 and 2 indicate that there is marginal, if any, benefit to additional active sediment remediation beyond Alternative B. Similarly, how can the long-term effectiveness related to surface water RAOs be assessed, given no estimates (qualitative or otherwise) are made for long-term surface water and tissue concentrations?

[15] Although a few of the Section 2 PRGs are based on EPA’s calculations of background levels (e.g., RAO 2 PCB PRG), the RAOs themselves call for achievement of acceptable risk levels without mention of background conditions.

- How does EPA determine the relative short-term effectiveness of the alternatives, given EPA makes no quantitative estimates of the short-term impacts to water quality or the time until protection is achieved (or other impacts like worker safety)? How can the balance of risks associated with short-term construction impacts and time to achieve RAOs be accurately determined?
- How can the alternative costs be even generally verified as accurate if the methods to calculate the quantities shown are not clearly presented (in either Section 3 or Section 4) and all associated quantities and costs are presented only on an aggregate Site-wide basis?

EPA's sediment guidance (EPA 2005a) addresses the role of quantitative estimates in making these critical decisions:

> "The time needed until protection is achieved can be difficult to assess at sediment sites, especially where bioaccumulative contaminants are present. Generally, for sites where risk is due to contaminants in the food chain, time to achieve protection can be estimated using models. These models may have significant uncertainty, but may be useful for predicting whether or not there are significant differences between times to achieve protection using different alternatives. When comparing time to achieve protection from MNR to that for active remedies such as capping and dredging, it is generally important to include the time for design and implementation of the active remedies in the analysis."

This guidance is particularly relevant for large and complex sites like Portland Harbor where uncertainties are often greater and quantitative estimates help to understand those Site uncertainties and better support appropriate remedy decision-making. For example, EPA Region 10 just recently completed decision-making using such quantitative approaches for the similarly complex Lower Duwamish Waterway site (EPA 2014).

DO NOT QUOTE OR CITE This document is currently under review by US EPA and its federal, state and tribal partners and is subject to change in whole or in part.

Table 2. Comparison of Alternative Evaluation Methods for EPA's Revised FS Section 4 and LWG's 2012 Draft FS.

FS Evaluation Criteria	EPA's Revised FS Section 4	LWG's 2012 Draft FS
Protectiveness	• "This criterion draws on the assessments conducted under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs." See the description of methods under these other evaluation criteria below. • Percent reductions in SWACs, and residual risks for those SWACs, immediately after construction is complete (i.e., "time-zero") for Remedial Action Level (RAL) chemicals are the only quantitative assessments presented. (As noted elsewhere in these comments, time-zero SWACs and risks are not in any way representative of the long-term outcome or overall protectiveness of the alternatives.)	• "The primary information used to make this determination is projected changes in surface sediment, fish tissue, and water column chemicals of concern concentrations derived from model simulations of each comprehensive alternative both during and after construction, and comparison of these projections with the range of sediment remedial goals, target tissue levels, and water quality criteria, respectively, as well as the timeframes to achieve such levels."
	• Unsupported statements are made about protectiveness of riverbank components of the remedy such as: "However, the extent excavation and capping under this alternative may not be sufficient to deal with the extent of the contamination in riverbank soils that may recontaminate the river sediments."	• Riverbanks were not included in the 2012 draft FS, per EPA direction at that time.
Compliance with Applicable or Relevant and Appropriate Requirement (ARARs)	• Descriptions of the alternatives are compared to ARARs summarized in the Section 2 tables.	• Descriptions of the alternatives are compared to ARARs. (ARARs not specifically noted in this table were handled using similar descriptive text in both EPA's Revised FS and the 2012 draft FS.)
	• Unsupported statements are made about the ability to meet water quality ARARs, such as: "Implementation of the alternative in conjunction with adequate upland source control measures over time are not expected to cause or contribute to exceedances of numeric human health and aquatic life water quality criteria and drinking water MCLGs and MCLs."	• "Short- and long-term surface water quality [modeling] projections for each alternative were compared with state and federal surface water quality standards and criteria."
	• An unsupported assumption is made about the ability to meet Oregon Cleanup Laws, such as: "Oregon's risk standards for degree of cleanup for hazardous substances will be met over time through implementation of remedial technologies, ICs, and monitoring."	• "Long-term sediment concentration [modeling] projections for each alternative were compared to potential cleanup value requirements included in this ARAR."
	• "A simplified approach was used that assumed armored	• Appendix M (approximately 400 pages) describes an

FS Evaluation Criteria	EPA's Revised FS Section 4	LWG's 2012 Draft FS
	and reactive caps within shallow water areas and riverbanks would result in unavoidable impacts that would require compensatory mitigation. This approach is presented in Appendix J." Appendix J contains 7 pages of text describing an approach that assumes that each acre impacted is fully functioning and that the function is fully lost due to the dredge or cap activity, which is clearly an incorrect assumption. The text also notes that "a compensatory mitigation framework will be developed."	"equivalency analysis," proposed compensatory mitigation framework, and estimated mitigation required to compensate for unavoidable adverse effects based on the actual existing and proposed habitat functions in areas addressed by each alternative.
	• Compliance with the Endangered Species Act is described as a future process of Biological Assessment (BA) development.	• The LWG submitted a draft BA for EPA consideration under separate cover at the same time as the 2012 draft FS.
	• Compliance with Federal Emergency Management Act flood and wetland regulations is described as a future process of alternative analysis and design.	• "A one-dimensional hydrodynamic model (HEC-RAS) of the Lower Willamette River and Multnomah Channel was used to evaluate compliance of each of the comprehensive alternatives with this ARAR (Appendix Lb)." This modeling was required by EPA at the time.
	• EPA compares Site bulk sediment levels to very conservative Toxicity Characteristic Leaching Procedure (TCLP)-based bulk sediment screening levels and land disposal restriction levels to determine relatively extensive areas of Resource Conservation and Recovery Act (RCRA) hazardous waste.	• Section 5 of the 2012 draft FS compares actual TCLP results to actual TCLP (liquid) criteria and F002 waste requirements to determine a few limited areas of RCRA waste.
Long-term Effectiveness	• The residual risks associated with time-zero SWACs are presented. (As noted elsewhere in these comments, time-zero SWACs and risks are not in any way representative of the long-term effectiveness of the alternatives. EPA defines long-term effectiveness as follows: "The evaluation of long-term effectiveness and permanence evaluation starts at the time RAOs and PRGs are met." The Remedial Action Objectives (RAOs) are mostly not met at time-zero as indicated by EPA's analysis.)	• "The QEAFATE model was used to project the following long-term contaminant concentrations [in sediments, water, and tissue] resulting from implementation of each alternative…"
	• Recontamination potential is evaluated through qualitative statements: "Because contamination within the areas of	• "This evaluation included examination of recontamination potential [using modeling information]

FS Evaluation Criteria	EPA's Revised FS Section 4	LWG's 2012 Draft FS
	construction is either removed, covered or treated in-situ, the overall concentrations of contamination available for resuspension is less than under Alternative A. Thus, there is less potential for contamination from source areas to continue to recontaminate other areas of the site and allow for MNR processes to occur."	at smaller spatial scales and assessed recontamination potential from ongoing known sources (e.g., stormwater, permitted industrial discharges, groundwater, and upstream inputs), along with localized recontamination due to dredging-related resuspension in adjacent areas."
	• Surface and groundwater are evaluated through qualitative statements: "In addition, some of the areas where groundwater contamination is discharging to the river will be capped to eliminate or reduce this discharge, which in combination with lower overall contaminant concentrations in surface sediment will decrease the time needed to achieve RAOs 3, 4, 7, and 8." Stormwater and upstream sources are not addressed.	• For groundwater: "These evaluations used QEAFATE model projections, which incorporated identified groundwater plumes (Appendix Ha, Section 3.2), to assess long-term surface water and sediment quality changes in groundwater discharge areas."
	• The long-term effectiveness of confined disposal facilities (CDFs) is not discussed.	• "The long-term effectiveness of on-Site disposal options included in each alternative was evaluated against the FS CDF Performance Standards (EPA 2010e and LWG 2010a and b; Appendix O) as defined in Section 6.2.9. The evaluations against the performance standards include modeling projections of CDF long-term contaminant isolation effectiveness presented in Appendix Jb."
	• Other aspects of long-term effectiveness (e.g., Adequacy and Reliability of Controls) not listed in this table are evaluated through general descriptions in both EPA's revised FS and the 2012 draft FS.	• Other aspects of long-term effectiveness (e.g., Adequacy and Reliability of Controls) not listed in this table are evaluated through general descriptions in both EPA's revised FS and the 2012 draft FS.
Reduction of Toxicity	• This criterion is evaluated through comparison of the volumes of ex situ treatment and acreages of in situ treatment provided by each alternative.	• The 2012 draft FS evaluates this criterion similar to EPA's revised FS.

DO NOT QUOTE OR CITE This document is currently under review by US EPA and its federal, state and tribal partners and is subject to change in whole or in part.

FS Evaluation Criteria	EPA's Revised FS Section 4	LWG's 2012 Draft FS
Short-term Effectiveness	• Community protection is evaluated by comparing the quantities and durations of the alternatives and qualitative statements such as: "Construction and operation activities may result in temporary noise, light, odors, potential air quality impacts and disruptions to commercial and recreational river users on both sides of the river. However, the actual duration at any specific location would be less than the overall construction period."	• Community protection is evaluated in a quality of life analysis in Appendix U with separate sections on aesthetics, odors and dust, noise, recreation, traffic, and navigation.
	• Work protection is evaluated through qualitative statements about the alternative durations such as: "Overall, the risks associated with this alternative would be less than for alternatives D though G due to the shorter construction period."	• "Protection of workers during construction of each alternative was assessed using calculated estimates of non-fatal and fatal injuries using incident occurrence rate data in conjunction with the anticipated construction operations associated with each alternative."
	• Environmental impacts and best management practices are discussed through mostly qualitative and non-comparative statements such as "Sediment removal may result in short-term adverse impacts to the river, including: o exposure of fish and other biota to suspended and dissolved contaminants in the water column, temporary loss of benthos and habitat for the ecological community in dredged areas, o increased emissions from construction and transportation equipment." o Environmental impacts associated with CDFs are not discussed.	• Environmental impacts are evaluated through quantitative and detailed analyses including: o "Water quality, recontamination, and downstream transport during construction were evaluated using QEAFATE model projections throughout the Site. Model-projected water column concentrations were compared to water quality criteria and benchmarks, while sediment quality projections were compared to remedial goals and RALs." Appendix U details results. o "The potential impacts of GHG and air pollutant emissions during construction of each alternative were estimated using standard air inventory calculation methods as described in Appendix Ic." o "The potential short-term impacts to water quality from on-Site disposal facility construction and filling for disposal options associated with each alternative were evaluated through review of the FS CDF Performance Standards."
	• Time protection is addressed through comparison of	• "The approximate timeframes required to achieve RAOs

FS Evaluation Criteria	EPA's Revised FS Section 4	LWG's 2012 Draft FS
	construction durations (which do not represent achievement of protection) and entirely unsupported statements, such as: "Following the estimated construction time, Alternative B would take the longest time to meet RAOs and PRGs, as the residual contaminant concentrations would be the greater than Alternative B through G, requiring more time for MNR processed to achieve the RAOs and success would be more uncertain." No quantitative analysis is conducted to support that the time to meet RAOs would be greater for smaller alternatives (see Comments 13 and 14 for more detail). Also, EPA uses time-zero SWACs to assess short-term effectiveness, which, confusingly, is the same metric used to determine long-term effectiveness.	were evaluated by comparing projected changes over time in sediment and tissue COC concentrations projected using the QEAFATE and Food Web Models to the ranges of sediment remedial goals and target tissue levels."
	• EPA's revised FS does not discuss green remediation practices and their potential use at the Site.	• In order to comply with EPA Section 10 requirements to consider green remediation opportunities as a potential means to reduce the environmental footprint of the remedial action, the 2012 draft FS Appendix N (46 pages) reviews current green remediation guidance and policy, identifies green remediation technologies and practices, and evaluates their applicability and feasibility to the remedial alternatives as identified in the 2012 draft FS.
Implementability	• Implementability is assessed through descriptive comparisons of durations and quantities involved with each alternative.	• Implementability is assessed through descriptive comparisons of durations, which the 2012 draft FS demonstrates are directly and proportionally related to the quantities involved with each alternative.
Cost	• Quantitative current-year and net present value cost estimates are included, but are presented only on a Site-wide basis. Quantities or costs related to specific Sediment Management Areas (SMAs) or Sediment Decision Units (SDUs; or any other type of subarea) contributing to overall costs are not presented in any way.	• Quantitative current-year and net present value cost estimates are presented including the cost buildup procedures by subSMA.
	• Details in the cost appendix "pdf" file includes additional details on cost assumptions, all on a Site-wide basis only.	• Details include comprehensive executable Microsoft Excel files down to the subSMA spatial scale.

DO NOT QUOTE OR CITE This document is currently under review by US EPA and its federal, state and tribal partners and is subject to change in whole or in part.

14. **Unclear and Unsupported Long-Term and Short-Term Effectiveness Evaluations –** As noted above, EPA does not provide quantitative long-term effectiveness estimates and very limited quantitative short-term effectiveness estimates. While the LWG acknowledges uncertainties in numerical estimates of some of the parameters involved (which are clearly described and evaluated through sensitivity analyses in the LWG's 2012 draft FS), there are appropriate methods to address these uncertainties, consistent with EPA guidance and recent EPA FS evaluations at other similar sites, as noted above. For example, The Lower Duwamish Waterway FS had many similar uncertainties, but a more balanced quantitative evaluation included in that FS proved key in those comparative evaluations (AECOM 2012). Dismissing or overly simplifying quantitative estimates of bioaccumulation, sediment transport, natural recovery, and dredging releases in the comparative evaluation of alternatives inappropriately biases the long- and short-term effectiveness evaluations. Specific issues created by EPA's approach include:

    a. EPA clearly defines that, "The evaluation of long-term effectiveness and permanence evaluation starts at the time RAOs and PRGs are met." EPA then relies on time-zero SWACs to estimate residual risks under the long-term effectiveness subsection. Given that time-zero SWACs represent estimated conditions immediately after construction completion, they do not estimate conditions after the RAOs and PRGs are met. EPA states earlier in Section 4 that time-zero SWACs are used because long-term modeling is considered "unreliable," but this does not explain how time-zero estimates are in any way relevant to evaluation of the criterion.

    b. EPA then uses the same time-zero SWACs to also evaluate the short-term effectiveness of the alternatives. Therefore, there is no differentiation between the metrics used to evaluate the long- and short-term effectiveness criteria. Again, EPA does not discuss how the same time-zero estimates can be used to evaluate both timeframes.

    c. Because time-zero SWACs do not represent long-term outcomes, EPA only provides a "qualitative" (i.e., highly subjective) discussion of the actual expected long-term outcomes for the alternatives. For example, EPA assumes that RAOs not met at time-zero will be met over some unknown amount of time due to MNR. However, acceptable risk levels defined in the Section 2 RAOs are often below background or equilibrium levels expected for the Site. EPA does not discuss how it is envisioned that all the acceptable risk levels below background could possibly be met over time through MNR.

    d. EPA describes the ability to estimate natural recovery and long-term outcomes of the alternatives as highly uncertain. Yet EPA asserts that the smaller alternatives (i.e., Alternatives B and D) will not achieve the RAOs as quickly as the larger alternatives (i.e., E, F, and G). Given EPA's stated concerns about predicting the uncertainties associated with the pace and timeframe of natural recovery, it is entirely unclear how EPA reaches this conclusion. A simple analysis of the alternative construction durations and the best available empirical estimate of the pace of natural recovery shown in Table 3, below, clearly illustrates that EPA's conclusions are unsupported.

The upper half of Table 3 presents EPA's construction durations and the LWG's best estimate of natural recovery rates (expressed as a half-life of 10 years) based on the observed decline in smallmouth fish tissue PCB concentrations sampled over the period from 2002 to 2012 (i.e., using empirical data, not modeling estimates; Anchor QEA 2013). The table shows that Alternatives B through F would all be expected to achieve PCB SWACs equivalent to Alternative G (within the margin of EPA-accepted analytical variability) by or before the time that Alternative G construction could be completed. Further, Table 3 does not include estimates of natural recovery between now and the start of construction (which is "Year 1" in the table). The best-case scenario for the first year of construction would be at least 2022 (assuming ROD in 2017, Consent Decree in 2019, and RD approvals in 2021). This means that natural recovery will have taken place for an additional 7 years before construction starts on any of these alternatives, and this time to start construction is conservatively *not* included in the Table 3 estimated SWACs. Thus, EPA cannot necessarily conclude that Alternatives G will achieve RAOs quicker than the smaller alternatives, as EPA indicates in Section 4.

The lower half of Table 3 presents the same comparison assuming a 12 hours/day construction schedule, instead of EPA's assumption that construction will proceed 24 hours/day. The LWG has strongly disagreed that a continuous 24 hours/day construction schedule over many years is a reasonable expectation for this Site. Again, the assumption is that no natural recovery takes place between now and the start of construction in at least 2022, which is very likely to be incorrect. Thus, considering the uncertainty of EPA's aggressively fast construction durations, the lower half of Table 3 shows that it is even less likely that larger alternatives (e.g., F and G) would achieve RAOs any quicker than the smaller alternatives.

The Table 3 analysis is simplistic and is not a complete evaluation of the time to achieve RAOs, such as provided in the 2012 draft FS using the QEAFATE modeling approach. For example, the pace of natural recovery would be expected to be faster than indicated in Table 3 because these calculations do not include estimates of natural recovery before or during the construction period. Further, EPA would likely argue that the half-life of 10 years assumed is highly uncertain, while the LWG would argue that the ability to construct these alternatives within EPA's estimated durations is highly uncertain. Consequently, Table 3 is not intended to represent the best interpretation of time to meet RAOs for the Site. Rather, Table 3 illustrates, using EPA's information and stated concern about evaluation uncertainties, that EPA's conclusions regarding larger alternatives meeting the RAOs more quickly are based on unsupported assumptions. Even a simple quantitative analysis, such as Table 3, is sufficient to show the bias in EPA's conclusions in light of the recognized uncertainties regarding the short- and long-term effectiveness of the alternatives.

DO NOT QUOTE OR CITE This document is currently under review by US EPA and its federal, state and tribal partners and is subject to change in whole or in part.

Table 3. Illustration of the Implications of the EPA Recognized Uncertainties in Predicting Time to Achieve RAOs.

PCB SWACs (ppb) Comparison Using EPA's 24-hour/day Assumption for Alternative Durations

Best Estimate Natural Recovery Half Life (yrs)* = 10

EPA Alternatives	Years**																	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
A (no action)	85	79.1	73.6	68.5	63.8	59.4	55.2	51.4	47.9	44.5	41.4	38.6	35.9	33.4	31.1	28.9	26.9	25.1
B				49.3	45.9	42.7	39.7	37.0	34.4	32.0	29.8	27.8	25.8	24.0	22.4	20.8	19.4	18.0
D					40.0	37.2	34.6	32.2	30.0	27.9	26.0	24.2	22.5	20.9	19.5	18.1	16.9	15.7
E							31.5	29.3	27.2	25.4	23.6	22.0	20.4	19.0	17.7	16.5	15.3	14.3
F												21.3	19.8	18.4	17.1	15.9	14.8	13.8
G																		15.3

PCB SWACs (ppb) Comparison Using LWG's 12-hour/day Assumption for Alternative Durations

EPA Alternatives	Years**																																			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**
A (no action)	85	79	74	69	64	59	55	51	48	45	41	39	36	33	31	29	27	25	23	22	20	19	18	16	15	14	13	12	11	11	10	9	9	8	7	7
B								49	46	43	40	37	34	32	30	28	26	24	22	21	19	18	17	16	15	14	13	12	11	10	10	9	8	8	7	7
D										40	37	35	32	30	28	26	24	23	21	20	18	17	16	15	14	13	12	11	10	10	9	8	8	7	7	6
E														32	29	27	25	24	22	20	19	17	17	15	14	13	12	12	11	10	9	9	8	8	7	7
F																								21	20	18	17	16	15	14	13	12	11	10	10	9
G																																				15

	Duration of alternative construction
XX	Year construction is completed and EPA estimated SWAC at that time.
XX	Year that alternative achieves the Alternative G post-construction SWAC, plus 20% (i.e., plus or minus 20% is the EPA acceptable analytical accuracy for organic compounds) using estimated natural recovery rate.

* Estimated natural recovery rate based on average smallmouth bass fish tissue half-lives using 2002, 2007, and 2012 data. Recent 2014 PCB sediment data appear to be approximately equivalent to this half-life.
** The years start at the assumed start of construction. The best-case scenario for the first year of construction would be at least 2022 (assuming ROD in 2017, Consent Decree in 2019, and RD approvals in 2021). This means that natural recovery will have taken place for an additional 7 years before construction starts on any of these alternatives, and this time to start is conservatively not included in the above estimated SWAC reductions.

e. As discussed in Comment 13, EPA makes no quantitative evaluations of short-term effectiveness for worker protection, air emissions, water quality impacts, or time to achieve protection (e.g., time to achieve the RAOs). (As shown in Table 2, the 2012 draft FS contains well-accepted, guidance-based methods to quantitatively estimate all of these impacts, but EPA chose not to use any of these tools.) Thus, there is no way for EPA to actually evaluate the balance of the construction impacts and time to achieve RAOs. For example, because dredging water quality and other construction impacts are expected for a duration of up to at least 18 years (for Alternative G using EPA's estimates), how much quicker do the RAOs need to be met to justify those impacts? If the dredging water quality impacts (and associated impacts to fish tissue concentrations) are estimated as very significant, the achievement of RAOs by a more construction intensive alternative needs to be much quicker than other alternatives to justify those significant water quality impacts. An entirely different conclusion might be reached if the dredging water quality impacts are estimated to be minimal for 18 years. But EPA makes no quantitative estimates of the magnitude of water quality impacts, despite the ready availability of commonly applied ERDC dredge water quality models such as the DREDGE model (ERDC 2015). Consequently, EPA's conclusions regarding the balance of short-term effectiveness across these overall impacts are unsupported and completely subjective.

f. EPA's short-term impacts evaluation (impact on community, workers, and environment) consists of making unsupported subjective statements about these likely impacts. EPA's evaluation fails to meet CERCLA requirements, which states, "The potential threat to human health and the environment associated with excavation, transportation, and redisposal, or containment," must be evaluated during remedy selection. See 42 U.S.C. § 9621(b)(1)(G). Additionally, 40 CFR 300.430(e)(9)(iii)(E) requires that an FS evaluate the following: short-term risks that might be posed to the community during implementation of an alternative, potential impacts on workers during remedial action and the effectiveness and reliability of protective measures, and potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation.

   Although Section 4 includes some general statements about these short-term impact issues, this does not fully address the regulatory requirements noted above. Rather, EPA often assumes negative impacts generated by the project will be controlled or eliminated during implementation through BMPs or similar measures (e.g., particularly with regard to dredging releases). A quantitative analysis of short-term risks is an essential element of a defensible FS. As the LWG has demonstrated in its 2012 draft FS, using available occupational and actuarial data, the worker risks generated by implementing each alternative can be predicted with greater certainty than the risks predicted from long-term exposure to sediment. For example, each truck trip to the proposed disposal facility generates over 1×10^{-6} risk of a fatality. Also, as discussed in Comment 5a, EPA does not assess community impacts at a reasonable level of detail.

15. **Inappropriate Benthic Risk Analysis –** EPA does not mention benthic community risks in the Section 3 RAL, SDU, or SMA development text (as noted in Comment 3). EPA must develop and evaluate alternatives that fully consider benthic risks using methods that are consistent with the BERA. Although EPA conducts an extensive SDU analysis to assess whether the selected RALs bound other risk pathways, EPA does not discuss the extent to which these RALs are expected to bound and address benthic community risks. In contrast, the 2012 draft FS included a detailed evaluation of and determination of benthic risk SMAs using the CBRA approach, as required by EPA at the time.

    Then in Section 4, EPA evaluates the alternatives for their ability to adequately address benthic community risks. EPA concludes that all the alternatives do not address through active remediation a "substantial" portion of the benthic community risks. For example, EPA states for Alternative G, "There are a substantial number of locations where unacceptable benthic risk (identified via bioassays or predicted via the Logistic Regression Model [LRM]) are not encompassed by the areas of construction as shown on Figure 4.2-11." EPA states that the remaining benthic risks will be addressed through MNR. While it is reasonable to address low-level risks through MNR (including benthic risks), EPA has constructed alternatives that ignore benthic risk and then demerits those same alternatives in the effectiveness evaluation for failing to adequately address benthic risks.

    EPA's benthic risk approach is particularly inconsistent given that EPA made multiple changes to the RALs between the draft and revised FS because EPA deemed the 2012 draft FS RALs for PAHs, DDE, and dioxin/furans as "not protective." This decision resulted in extensive work to recalculate all the SMAs and alternative quantities and costs. EPA does not attempt to explain in Section 4 whether EPA could have avoided all of this rework and instead similarly decided that MNR would address relatively low-level risks for PAHs, DDx, and dioxin/furans that EPA deemed were not directly addressed by the 2012 draft FS RALs. There are some important additional technical issues with EPA's benthic risk approach as follows:

    a. EPA's method for defining benthic risks requires additional explanation. EPA provides one figure series (Figure 4.2-11 and Figures 4.2-14 through 17) and two statements regarding the methods used: 1) "Identified via bioassays or predicted via the LRM"; and 2) "Additionally, benthic risk is evaluated by determining the percentage of measured or predicted benthic toxicity points addressed by the construction of the alternative." The term "toxicity points" is new and not defined. Consequently, these results are not reproducible and the subsequent, related conclusions appear unsupported.

    b. From examination of the cited figures, it appears that EPA used any instance of a Level 2 or Level 3 bioassay hit and any exceedance of the LRM benthic screening levels to determine that "benthic risk" was present at any given sampling station. The BERA is clear that individual benthic toxicity lines of evidence are insufficient to fully characterize benthic risks at the Site.

Therefore, EPA's "toxicity points" methodology appears inconsistent with the EPA-approved BERA. This is despite EPA indicating that risks were evaluated in Section 4 "consistent with the BERA." Further, the BERA is clear that the LRM screening levels are relatively poorly correlated with observed toxicity as compared to the FPM model. EPA provides no justification for focusing on the LRM screening levels rather than other available screening levels from the BERA. Further, EPA appears to not be using the EPA-proposed benthic toxicity PRGs from Section 2, which EPA indicates in Section 2 determine attainment of RAO 5.

16. **Inappropriate Cost Estimates –** EPA's costs estimate methods and results are insufficiently detailed to support the FS evaluations and consistently minimize the apparent costs of the larger alternatives and dredging, as compared to the smaller alternatives and capping. Given the lack of supporting information and the compounding effect of the many errors and inconsistencies with the limited information that is provided, it appears highly unlikely the overall cost estimates would achieve the +50% to -30% precision required by EPA FS costing guidance (EPA 2000).

    a. Section 3 does not contain any details on the development of alternative quantities, such as areas, dredge volumes, and placed material volumes (e.g., caps and backfills), and as noted in the Section 3 significant issues, the total quantities that are provided are often inconsistent in various text and table locations, sometimes with variations in excess of 100%. Given that much of the alternative costs are developed using unit costs (i.e., dollar cost per unit of quantity), understanding the process steps and accuracy of quantity estimates represents half of the typical costing procedure but is almost completely undescribed.

    b. The cost estimates for each alternative are presented on a Site-wide basis only, with no spatial differentiation within the Site. It is impossible to determine the subareas (such as SMAs or SDUs) within the Site from which quantities or costs originate. In contrast, the 2012 draft FS contained detailed executable Excel spreadsheets that showed the "build up" of the costs starting from a subSMA spatial scale.

    c. Overall, EPA's cost estimates are much higher than the alternatives presented in the 2012 draft FS, but the additional effectiveness and protectiveness provided by these additional expenditures is entirely unclear for reasons discussed in Comments 13 and 14 above. Further, EPA has substantially and proportionally increased the costs of the smaller alternatives, as compared to the larger alternatives. For example, EPA's Alternative B Net Present Value (NPV) cost estimate is 2.4 to 4.7 times more expensive than the 2012 draft FS Alternatives B-i and B-r, while EPA's Alternative G NPV cost estimate is 1.4 to 2.8 times more expensive than the 2012 draft FS Alternatives F-i and F-r. Thus, as compared to the 2012 draft FS, the costs of EPA's smaller alternatives have increased by approximately 70% more than the cost increases associated with the larger alternatives. EPA's Alternative B NPV cost is now approximately $791 million (Table 4.3-1), as compared to the

2012 draft FS Alternative B range of $169 to $330 million. And EPA screens out Alternative C entirely in Section 3, so the next EPA alternative is Alternative D at an NPV cost of $1.1 billion. As a result, there is no longer any reasonably defined "low cost alternative" to support evaluation of a wide range of potentially cost-effective remedies for the Site.[16]

d. Appendix J (Compensatory Mitigation Requirements), Section J3.2 (FS Mitigation Assumptions and Cost Evaluation) describes the simplified approach that was used to determine the extent of mitigation that could be required under each alternative and to develop potential mitigation costs. The approach includes totaling acreages of shallow water and river bank areas with cap and dredge technology assignments that are then multiplied by a unit cost (per acre) for mitigation.

   This approach assumes that each acre impacted is fully functioning and that the function is completely lost due to the dredge or cap activity. This is not a reasonable assumption given that most shoreline and bank areas in the harbor are degraded and provide limited habitat function and value (e.g., presence of contaminants, steep slope, and limited riparian area). Therefore, all of the mitigation costs provided are likely conservatively high. This approach yields large dollar amounts for mitigation across the alternatives ($32 million to $382 million over 14 to 163 acres). During design when actual existing and proposed habitat conditions are considered, the actual mitigation needs will likely be significantly lower.

e. EPA increased some cost assumptions for capping, which favor making capping more expensive relative to dredging. (By contrast, as discussed in Comment 16f below, EPA minimizes the costs of many aspects of dredging.) EPA increased cap placement and material purchase costs 35% above the 2012 draft FS unit rates with no explanation. Similarly, EPA increased armor placement and material purchase by 83% with no explanation.

f. Despite adjusting the overall range of costs substantially upward, EPA appears to also be using a number of assumptions that make the larger and dredging-intensive alternatives appear optimistically less costly. Examples include:

   i. EPA used a 7% discount rate, which is indicated on the first page of EPA cost estimate guidance for FSs (EPA 2000). However, the second complete paragraph on page 4-5 of that guidance indicates that a different discount rate can be used as long as it is justified consistent with OMB Circular A-94. Accordingly, the 2012 draft FS used a discount rate of 2.3%, consistent with guidance as explained in that document. The equivalent treasury rate for 2015 is 1.4%, which is a much more appropriate discount rate at a site where the PRPs include the

[16] This is particularly true given that the 2012 draft FS concluded that Alternative B was the most cost-effective alternative, and EPA has not shown in the revised FS why this conclusion is false for reasons stated in Comments 13 and 14.

United States, the State of Oregon, municipalities, public utilities, and many parties whose principal or only source of funding for cleanup are insurance funds outside their investment control. The effect of EPA's higher discount rate is that the larger alternatives with greater construction durations are heavily discounted (i.e., Alternative E is discounted a total of 41% and Alternative G is discounted by 77%).

ii. EPA used an unexplained mobilization/demobilization factor of 1.6%, while the 2012 draft FS used 15% factor based on project experience at similar sites.

iii. EPA used a contingency factor of only 20%, while the 2012 draft FS used 40%. EPA guidance indicates that the overall contingency for an FS should be in the 20 to 45% range. Thus, EPA is using the lowest possible contingency factor allowed by guidance. EPA cites guidance indicating that larger projects with high costs may have lower overall contingency factors. This may be true for some types of projects, but given the complexity of this Site and the large number of issues that will be refined in design, using the lowest possible contingency factor appears very optimistic and greatly decreases the costs of the alternatives, particularly the largest alternatives.

iv. EPA used lower percentages for Project Management (2%), Remedial Design (2%), and construction management (3%) than EPA guidance (5%, 6%, and 6%, respectively). These factors are also lower than the 2012 draft FS, which used 15% for remedial design and a monthly rate for project management and construction management.

v. EPA used a 1.75 factor times the "neat" volume to obtain total volumes for each alternative (average of the 1.5 to 2.0 range indicated by EPA). The 2012 draft FS approach included specific factors applied to actual FS-level dredge prisms to estimate overall volumes, whereas EPA's simplistic neat volume approach sets a depth for each 10 × 10-foot "pixel." EPA's approach underestimates dredge volumes, as the LWG has previously commented (LWG 2014a). Consequently, EPA's volume factor of 1.75 is optimistically low.

vi. EPA is assuming a 140-acre offloading facility will be developed somewhere on the river, as compared to the 2012 draft FS assumption of a 20-acre facility. EPA then assumes the same development costs for this facility as the 2012 draft FS, despite EPA's assumed facility being 7 times larger. (EPA adjusted some other facility costs to partially account for this much larger facility.)

vii. EPA assumes that all dredge dewater must be treated at a dedicated water treatment facility before discharge to the river. This will require extremely robust and costly treatment methods to meet low water quality criteria and state standards. However, EPA includes no water treatment costs for water generated during dredging. Even typical environmental dredging practices create large volumes of dewater. Further, EPA also assumes widespread use of an articulated arm bucket, which generates relatively greater amounts of water (i.e., approximately a cubic yard of water will be generated for each cubic yard of dredge material). Consequently, the absence of water treatment costs is a significant omission in the cost estimates.

viii. EPA conducted a cost sensitivity analysis, although it does not appear to be used in the main text of Section 4. The sensitivity analysis does not vary many of the factors that are expected to contribute most to variations in costs (some of which are described above). Also, there are several aspects of the sensitivity analysis that are incorrect or represent impossible situations not reflective of actual cost variations. For example, EPA varies alternative durations without varying the associated capital costs. EPA also varies the volumes by small factors without varying the resulting construction durations. Consequently, the sensitivity analyses do not represent a reasonable evaluation of whether EPA's cost estimates are within the guidance requirement of +50 to -30% precision.

g. There are significant equipment and contracting issues associated with executing multi-year projects where tens of millions of dollars of equipment need to be mobilized to the Site. The cost estimates do not factor in the standby costs created by idle equipment for two thirds of each year while the construction window is closed.

h. Other aspects of EPA's FS methods that appear to underestimate costs that are noted in other comments include:

i. Optimistic construction durations reduce costs related to labor or equipment time.

ii. Volumes, and therefore associated removal costs, appear likely to be underestimated.

iii. The cost impacts related to use of innovative and extensive techniques to reduce dredge releases do not appear to be considered.

17. **Risk Inconsistency –** EPA's methods and results are often inconsistent with the BLRAs throughout the FS including Sections 2, 3, 4. This culminates in Section 4 with a residual risk assessment that departs significantly from the methods and findings of the BLRAs. The LWG has commented to EPA on numerous occasions (e.g., LWG 2014d, 2015a, 2015b) that EPA should include risk management steps in the FS consistent with guidance. These comments include that EPA should address only those potential risks for contaminants, media, and pathways that were clearly found to pose unacceptable risks in the BLRAs and that EPA should further focus on the subset of unacceptable risks that are required for selecting an effective and protective remedy using all of the FS criteria. Instead, EPA has departed from the BLRAs and applied virtually none of the risk

management steps noted in guidance such as the 2005 sediment remediation guidance and EPA's 11 Risk Management Principles Memorandum for, "making scientifically sound and nationally consistent risk management decisions at contaminated sediment sites." The relevance of this guidance to risk management steps in the FS is reviewed in detail in Sections 10.1 and 10.2 of the 2012 draft FS. In summary, EPA guidance (2005a) discusses "Risk Management Principles and Remedial Approaches" and clearly describes that the cleanup should use a "risk-based framework"; "select site-specific, project-specific, and sediment specific risk management approaches that will achieve risk-based goals"; and "ensure that sediment cleanup levels are clearly tied to risk management goals" (p. 1 – 5).

Specific issues related to EPA's lack of consistency with the BLRAs, residual risk assessments, and lack of risk management include:

a. Per the LWG's 2014 Section 2 comments (LWG 2014d) and consistent with law, EPA guidance, and precedents from other sediment sites as detailed in past comments:

   i. RAOs, COCs, and PRGs should only be designated for contaminant exposure scenario pairs (ecological or human health receptors and pathways) for which the EPA-approved BLRAs identified potentially unacceptable risk from in-river media (e.g., not potential upland source media, and ARARs should not be used to develop PRGs for non-COCs).

   ii. PRGs should be established and applied for these COCs consistent with risk assessment methods (e.g., spatial scales) and only where sufficient technically valid information exists to do so.

   iii. The FS should focus on those COCs and PRGs that are technically practicable to achieve and for which acceptable risk levels can be reached through the sediment remedial action alternatives being evaluated in the FS.

   iv. COCs and PRGs should only be established if reasonably conservative risk management approaches indicate that a contaminant is significantly contributing to risk and that evaluation of remedial alternatives with respect to a PRG for a particular COC/exposure pathway pairing is required in order to select a protective remedy.

   v. Consistent with EPA background guidance (EPA 2002), PRGs should not be set below reasonably achievable anthropogenic background levels (this includes the concept of "equilibrium" as explained in LWG 2014g).

   The LWG's Section 2 comments (LWG 2014d) detail how each of these concepts is consistent with remediation regulations and guidance.

b. Similarly, RALs for each COC should be applied consistent with the exposure and potentially unacceptable risk areas defined for that COC in the BLRAs (e.g., RALs should not be applied where the exposure pathway or unacceptable risks for those COCs do not currently exist). This is consistent with the "risk-based framework" required by guidance, as cited above. The issue of RAL consistency with the BLRAs is also noted in the Comment 3.

c. EPA presents a residual risk evaluation in Section 4 and indicates that the risks were calculated using methods consistent with the BLRAs. No details are provided on how the risk calculations where performed. Appendix H is entitled "Residual Risk Evaluation," but this appendix only contains a brief description of how time-zero SWACs were estimated on a rolling river mile basis. Additional information on the exposure assumptions, exposure point concentrations (for both sediment and tissue), and toxicity values is needed to evaluate consistency with the BLRAs. EPA's statement of consistency with BLRA methods is not enough to ensure that the methods are fully understandable or reproducible. Regardless, even based on the limited information presented, it is clear that EPA's methods are not consistent with the BLRAs in at least several respects. Examples include:

    i. For human health sediment direct contact, time-zero SWACs were generated for shoreline areas (excluding the navigation channel) on a 1-river mile spatial scale, according to Appendix H. (However, the main text indicates instead that 0.5 river mile spatial scales were used. Also, Figure 4.2-1 suggests that EPA included the navigation channel in RAO 1 assessment, which would be incorrect.) Regardless, of how EPA actually did the assessment, sediment direct contact risks were evaluated in the BHHRA for shoreline *half* river miles, excluding the navigation channel.

    ii. For human health fish consumption risks, SWACs were generated on a 1-river mile basis longitudinally split into the two shoreline areas and the navigation channel. However, in the BHHRA risks were evaluated by whole river miles with no longitudinal splitting for recreational fish consumption. Further, it is unclear which fish consumption scenario is actually being presented in the residual risk figures. If the subsistence fisher scenario is being presented, this was evaluated on a Site-wide basis in the BHHRA (not by river mile). The text on page 4-6 indicates that EPA calculated tissue concentrations from the SWAC estimates, but no tissue concentrations are presented. The text also indicates that these estimated tissue concentrations were compared to the PRGs for RAO 2. The LWG indicated in the Section 2 comments (LWG 2014b, 2015a, 2015b) disagreement with several aspects of EPA's tissue PRG calculations (and that such tissue levels should be classified as PRGs at all) because EPA was not consistent with the BHHRA methods.

    iii. The human health residual risks for Alternative A are higher than the maximum risks calculated in the BHHRA, which indicates there are inconsistencies (residual risks should not be higher than baseline). The highest non-cancer risk for a breastfeeding infant in the BHHRA was 10,000. The residual risk assessment indicates the highest non-cancer risk for a breastfeeding infant would be 210,000.

iv. There is a significant disconnect between the BHHRA and residual risks for RAO 2 for dioxins/furans. For a breastfeeding infant, the highest hazard quotients for dioxin/furan TEQ calculated in the BHHRA were 10 on a Site-wide basis (tribal fish consumption, whole body diet) and 10 on a river-mile basis (recreational RME consumption, RM 7). Figure 4.2-4c(1) indicates that the HQ from HxCDF alone (not the entire TEQ) is more than 14,000 for Alternative A. For a child, the highest hazard quotients for dioxin/furan TEQ calculated in the BHHRA were also 10 on a Site-wide basis (tribal fish consumption, whole body diet) and 10 on a river-mile basis (recreational RME consumption, RM 7). Figure 4.2-3f(1) shows a HQ greater than 30 for just HxCDF. The RfD has changed since the BHHRA was completed, but that does not account for the difference between the BHHRA and residual risks.

v. Continued exclusion of the site use factor from the BHHRA for BaPEq RAO 1 PRG (106 µg/kg) results in concluding that not even Alternative G will result in SWACs meeting the PRG at time zero in east and west river miles (per EPA's Table 4.2-1). However, if the BHHRA site use factor is accurately applied to this PRG (424 µg/kg), Alternative A appears to achieve RAO 1 in all East RMs (according to EPA's Figure 4.2-7b).

vi. Residual risk figures should show and Section 4 should discuss human health risks compared to a 10^{-4} threshold in addition to the 10^{-6} threshold to fully evaluate the range of effectiveness. EPA's Section 2 presents PRGs calculated on both a 10^{-4} and 10^{-6} thresholds. EPA should evaluate alternatives in the entire acceptable risk range (10^{-4} to 10^{-6}) against the FS evaluation, not just variations of RALs all targeted at 10^{-6} or lower risk.

vii. For ecological sediment direct contact, SWACs were generated on a 0.2-mile basis with longitudinal splitting. This spatial scale may or may not be representative of the combined lines of evidence approach used in the BERA to assess benthic risks, given areas of benthic risk were defined for various sized clusters of sampling stations. Further, the hazard quotients presented in the figures appear to be generated by simply dividing the SWAC by the individual PRGs in Section 2, which are mostly based on generic literature Probable Effects Concentrations (PECs). The LWG has already commented on Section 2 (LWG 2014b, 2015a, 2015b) that use of the individual PECs is not consistent with the BERA determinations of benthic risks using multiple lines of evidence.

viii. For ecological bioaccumulation risks, SWACs were generated on a 1-river mile basis with longitudinal splitting. However, the receptors that appear to be used in the residual risk calculations were evaluated over various exposure spatial scales. For example, osprey egg assessment appears to be the receptor of choice for dioxin/furans and DDE, and osprey exposure was assessed in the BERA on a much larger spatial scale than 1 river mile. Thus, it is unclear how EPA's one spatial scale assessment can be consistent with all of these various BERA assessments. Further, the LWG has already commented for Section 2 that some of the receptors EPA focuses on for RAO 6 PRG development, and EPA presumably is focusing on for this residual risk assessment, are inappropriate and inconsistent with the BERA for reasons detailed in those past comments (LWG 2014b, 2015a, 2015b).

ix. The statement in Section 4.1.6.1 that "ecological hazard quotients are calculated using the estimated sediment concentrations and the risk-based PRGs for RAOs 5 and 6, consistent with the process used in the BERA" is misleading in its claim that RAO 5 and 6 PRGs are risk-based. The assertion that this EPA process used to calculate ecological hazard quotients is consistent with the BERA is obviously wrong because ecological hazard quotients that EPA reports in Section 4.2.1 for alternative A (no action) are much higher than BERA HQs. The residual risk assessment is also apparently inconsistent with the BERA in its use of "ecological hazard indices," although this is unclear because EPA has not defined the term.

x. The residual ecological risk assessment is inconsistent with the BERA in asserting that riverbank soil poses risk. No analysis is provided to back up this assertion and no analysis of riverbank soils (as defined in the RI) were assessed in the BERA.

xi. Despite EPA providing few method details, these aspects of EPA's residual risk methods can be shown to be inconsistent with the BLRAs. This suggests it is highly likely that other details of the methods, if they were known, would also be inconsistent with the BLRA methods.

18. **Inappropriate Resource Conservation and Recovery Act and Other Waste Determinations –** Sections 3 and 4 present several determinations regarding RCRA hazardous waste and the Oregon Pesticide Residue Rule that are inconsistent between sections or incorrect. These include:

    a. The LWG disagrees with EPA's assumptions regarding the potential designation of sediments offshore of the Arkema site as State-listed wastes under the Oregon Pesticide Residue Rule. This designation was disputed by LSS during the Arkema EE/CA, and EPA has yet to resolve this issue with DEQ. EPA's interpretation of the Oregon Pesticide Residue Rule will not be resolved through further testing, as suggested by Section 3.3.5.1 in the FS: "Appropriate testing will need to be conducted to determine if sediment removed from the approximate areas shown on Figure 3.3-39 contains these listed RCRA- or State-listed wastes."

    b. EPA indicates that there is RCRA hazardous waste in sediment off of the Arkema Site due to chlorobenzene (see Fig.4.2-2d). (Incidentally, the green area shown in this figure is not the highest sediment concentration for chlorobenzene in this area. Consequently, it is unclear how EPA arrived at the green area noted in the figure.) During the Arkema EECA characterization work, 15 cores were obtained from the area of highest sediment contamination (between the docks) and run for a full TCLP analysis. Regarding chlorobenzene, in order for it to be a characteristic (toxicity) hazardous waste, it would have to exceed 100 mg/L chlorobenzene Toxicity Characteristic Leaching Procedure (TCLP) level. The highest TCLP concentration result for chlorobenzene in the EE/CA sampling was 22 mg/L, and the average was less than 5 mg/L. Therefore, it is technically incorrect for EPA to designate any sediment off the Arkema Site as characteristic hazardous waste based upon the presence of chlorobenzene.

c. Page 4-23 presents additional EPA determinations beyond those presented in Section 3 regarding RCRA waste determinations. EPA indicates in Section 4 that TCLP bulk sediment screening levels are used to determine likely RCRA hazardous wastes. However, Section 3 indicates that actual TCLP (leachate liquid) results are used for RCRA hazardous waste determinations. In general, it is inappropriate to use bulk sediment TCLP screening levels for determinations of hazardous waste, even at an FS level, particularly when an extensive set of actual TCLP results are available. The primary reason is that the bulk sediment screening levels assume that all of the chemical present in the bulk sediment will be leached out during the TCLP test. This is almost never the case, so such screening levels are as conservative as possible. Also, the FS TCLP data were collected under an EPA-approved field sampling plan. EPA provides no rationale for why bulk sediment screening levels are used in Section 4 instead of the EPA-directed TCLP results used in Section 3.

d. EPA appears to use RCRA Land Disposal Restriction (LDR) values to identify large areas of soil and sediment that must be treated prior to disposal if excavated or dredged. Section 4.2.2.2 (page 4-23) states, “Waste will also be sampled as generated to determine any volumes that exceed Land Disposal Restrictions (LDRs) and will require the prescribed treatment prior to disposal. LDR values have been established for 39 COCs as shown in Table 4.2-11. The RI data set indicates that 32 COCs exceed the criteria. The locations where these criteria are exceeded is presented on Figures 4.2-13a-e.” We read this text and the referenced table and figures to suggest that all dredged sediments with concentrations exceeding the values on Table 4.2-11 must be treated prior to disposal.

   RCRA land disposal restrictions apply only to RCRA “hazardous wastes.” 40 CFR §268.1(b): “The requirements of this part apply to persons who generate or transport hazardous waste.” “To be subject to the land disposal restrictions, a waste must first be a RCRA hazardous waste. Unless a waste meets the definition of a solid and hazardous waste, its disposal will not be subject to the LDR program.” *Introduction to Land Disposal Restrictions*, p. 5 (EPA530-8-05-013, September 2005). *See also, Management of Remediation Waste Under RCRA*, p. 2 (EPA530-F-98-026, October 14, 1998) (“Note that not all remediation wastes are subject to RCRA Subtitle C hazardous waste requirements. As with any other solid waste, remediation wastes are subject to RCRA Subtitle C only if they are listed or identified hazardous waste. Environmental media are subject to RCRA Subtitle C only if they contain listed hazardous waste, or exhibit a characteristic of hazardous waste.") Many of the LDR values identified in Table 4.2-11 are well below DEQ risk-based cleanup values for residential soil, and non-RCRA hazardous waste remediation wastes can safely be managed in Subtitle D landfills without prior treatment.

i. EPA's Section 3 presents only one instance of TCLP results indicating toxic hazardous waste (near Arkema) and another instance of a TCLP exceedance at Gasco, where EPA notes that MGP wastes are "by definition not RCRA hazardous wastes per 40 CFR §261.24(a)." EPA notes two specific and spatially limited instances of potential listed waste. Other than in these limited areas, RCRA LDRs are not even potentially applicable and should not be considered in the FS or in remedy selection. See *Management of Remediation Waste Under RCRA* (p. 6): "If hazardous waste was originally disposed of before the effective dates of applicable land disposal restrictions and media contaminated by the waste are determined not to contain hazardous waste when first generated (i.e., removed from the land, or area of contamination), the media are not subject to RCRA requirements, including LDRs."

ii. Although there are no references for the LDRs identified on Table 4.2-11, the values appear to be the Universal Treatment Standard (UTS) values found in 40 CFR 268.48 Table UTS. Where LDRs may be applicable at this Site because of the presence of listed or characteristic RCRA wastes, 40 CFR §268.49 provides alternative treatment standards for soil (including sediment) containing hazardous waste. Generally, 40 CFR §268.49 requires that soil containing a listed hazardous waste or exhibiting the toxicity characteristic of hazardous waste must be treated prior to land disposal to remove 90% of the underlying hazardous constituent concentrations or to 10 times the UTS, whichever would be achieved first. That is, the LDR values in EPA's table are low by a factor of at least 10.

EPA's disposal decision tree (Figure 3.3-40) indicates that RCRA hazardous waste will be ex situ treated and then disposed of in a Subtitle C landfill. But the cost appendix (G) makes no mention of any treatment or disposal requirements and associated costs assumed for RCRA hazardous waste. Consequently, it is unclear whether EPA actually included in any alternatives an assumption of ex situ treatment and Subtitle C disposal any of the potential RCRA hazardous waste discussed in Sections 3 and 4.

19. **Low Level of Detail, Clarity, and Consistency** - EPA does not present intermediate details that lead to many of the estimates made in Section 3 (e.g., quantities, durations, locations of various Site or alternative features, etc.). Also, many alternative requirements are simply stated with little or no explanation of the reasoning behind the

choices involved. Further, many aspects to EPA's descriptions are inconsistent between locations in the text, between text and figures, or between text and tables. This makes the overall approach difficult to understand, and it is not currently reproducible even to a general degree.

Some examples of the inconsistencies and missing information in Section 3 include (but are not limited to):

a. EPA does not explain how the PTW highly toxic thresholds were derived. EPA orally referred at the July 29, 2015 roll-out meeting to a 2014 EPA Technical Memorandum. The memorandum was stamped preliminary draft and contains multiple other methods that EPA appears to have abandoned or revised in the interim. This memorandum therefore does not provide a clear description of EPA's current methods. Also, the LWG commented on the memorandum (LWG 2014c) and EPA appears to have rejected those comments in total.

b. The rationales for several aspects of the RAL determination methods are not explained. For example, why did EPA use Site-wide RAL curves almost exclusively after commenting repeatedly on the 2012 draft FS that there was too much focus on Site-wide spatial scales during RAL development and other FS steps? Similarly, why does EPA show a smaller scale RAL curve for DDx only? This selective use of a smaller spatial scale for this particular COI appears arbitrary. Why do so called "Site-wide" RAL curves range in acreage covered from 2,200 acres to 180 acres? How do any of these RAL curve spatial scales relate to PRGs being compared to, which should applied using spatial scales at least roughly similar to the exposure assumption spatial scales in the BLRAs? Where do the background replacement values come from and why are they appropriate? We assume that the TPAH PRG of 970 ppb is an error, as the RAO 5 PRG used both in Sections 2 and 4 is 23,000 µg/kg.

c. EPA does not explain the rationale or process for many aspects of the proposed technology assignment approach. For example, the "smoothing" step is only described as an "algorithm." The algorithm is not in any way described and the results before and after the smoothing step are not presented (at least in a way that can be identified as such). Further, Figures 3.3-27a-f present the technology assignments resulting from the scoring matrix and are introduced well after the smoothing algorithm is mentioned. Yet these figures contain many very small scale assignments of dredging or capping that appear to constitute only a few pixels each. It is unclear whether this is the "smoothed" version or not.

d. EPA shows more than 2500 acres although it has agreed in the past that the Site is about 2200 acres. Also, EPA shows technology assignments downstream of RM 1.8. EPA indicated in the August 13 conference call that EPA did not intend to expand the Site area, but the above Site acreage and mapping inconsistencies have not been explained by EPA.

DO NOT QUOTE OR CITE This document is currently under review by US EPA and its federal, state and tribal partners and is subject to change in whole or in part.

e. The technology assignment scoring matrix is presented as applying to the entire Site with only a couple of "off ramps" to the process identified. Examination of the decision trees for shallow, intermediate, and deep areas show that the scoring matrix is only used and applied in the intermediate areas (which constitute a fraction of the Site). Thus, it appears other a priori decisions that are not fully explained lead to the selection of remedial technologies over the majority of the Site area, or alternatively, the actual approach used by EPA is unclear.

f. There are multiple inconsistencies between the text and technology assignment decision trees including the following examples:

   - As noted briefly above, Figures 3.3-27 and 3.6-02 through 07 show different technology assignments in a number of intermediate to shallow areas throughout the Site. EPA could not readily identify in the July 29, 2015 meeting the sources of differences in technology assignments between the two maps. It is unclear that either map is consistent with the technology scoring matrix and decision trees presented in Section 3.

   - All text describing decision points in the decision trees involving PTW discuss that certain decisions are based on the presence of NAPL and PTW that is not reliably contained. However, all the decision trees make a distinction between PTW that is not reliably contained and PTW that is reliably contained[17]. NAPL and its role in the decision process is not mentioned in any of the decision trees. Consequently, it is unclear on every decision tree point involving PTW exactly which sediment characteristics are actually being considered in those decisions.

   - EPA indicates in the text about intermediate areas that, "Contaminated sediment will be dredged to the lesser of the RAL concentrations or 15 feet (assumed maximum depth since special design and side slope stabilization considerations would need to be conducted on an area-specific basis). If NAPL or PTW that is not reliably contained has been identified in a dredge area, then either an armored reactive cap or a reactive residual layer is assumed. Otherwise, a residual layer is assumed." However, the decision tree figure for intermediate areas indicates a distinction between PTW that is not reliably contained and PTW that is reliably contained. Following the decisions path for PTW that is reliably contained, all post-dredge options assume a "reactive residual layer" not a "residual layer." A similar inconsistency exists between the text and decision trees presenting the approach for navigation channel areas.

[17] As noted above, the LWG disagrees that there is such a thing as PTW that can be reliably contained, given that EPA' PTW guidance indicates reliably contained is one of the criteria used to define PTW.

- EPA indicates in the text for shallow areas that, “Contaminated sediment will be dredged to the lesser of the RAL concentrations or a maximum depth of 5 feet, and the dredged material will be replaced with an engineered cap to previous elevation. Otherwise, the contaminated sediment will be dredged 3 feet and replaced with an engineered cap.” However, the shallow area decision tree figure shows that for the “otherwise” step that areas dredged to 3 feet that are not PTW that is not reliably contained might be assigned either an engineered cap or a reactive cap depending on whether they are in a groundwater plume area.

g. Methods and site data used for defining NAPL in cores shown in Figures 3.3-28 and 29 are not described. In the July 29, 2015 roll-out meeting EPA indicated that “site data were used” in this determination. However, for example, the NAPL area defined in Figure 3.3-29 for the Gasco area differs somewhat from the substantial product areas delineated for the Gasco EE/CA, using methods previously directed by EPA on that site. Similarly, LSS has indicated in past comments that no evidence of NAPL exists in cores near the Arkema site, and yet EPA defines some NAPL areas in this region in Figure 3.3-28. Given that there is no obvious agreement on the NAPL areas defined in these figures, this strongly indicates the need for EPA to carefully explain the methods and rationale leading to these NAPL figures.

h. In general, Figure 3.3-40 is inconsistent with the text of Sections 3 and 4 (which are inconsistent with each other). The sediment and soil disposal decision tree framework presented in Figure 3.3-40 does not identify a treatment step for PTW that cannot be reliably contained, and provides an option for the waste to be disposed in either Subtitle C or D. However, the Section 4 text for each alternative states that removed PTW that is not reliably contained is assumed to undergo ex situ treatment. (For example see Section 4.2.2.4 Reduction of Toxicity, Mobility or Volume.) Figure 3.3-40 also indicates that treatment is required for PTW containing source material, PAHs or DDx, but that after treatment the waste can be disposed in Subtitle C or D or even the CDF depending on a number of factors. Section 4.3.4 text inconsistently states “All PTW treated ex-situ in Alternatives B through G is assumed to be disposed at a RCRA Subtitle C facility.” Footnote 1 of the decision tree appears to state that MGP remediation waste may require special management not only if it exceeds TCLP criteria but also in the case of “special considerations such as worker safety and equipment decontamination.” It is unclear precisely what this means, but we are unaware of what criteria EPA would use to determine that “special considerations” required Subtitle C disposal of MGP remediation waste or any regulatory basis for those “special considerations,” let alone for the application of land disposal restrictions to non-RCRA hazardous waste. Figure 3.3-40 is inconsistent with the 2009 EPA order for the Gasco Sediment Site.

i. Critical terms used to describe remedial technologies are not clearly defined and are intermixed. For example, as noted above, EPA refers many times to "caps," "engineered caps," and "armored caps" among other formulations. It is unclear when these are referring to the same or different types of caps.

j. The methods EPA uses to derive the quantities shown in Section 3.6 are poorly explained or unexplained. Also, a rapid review of the quantities presented in Section 3 shows multiple inconsistencies and apparent errors. One example is that Section 3.6.3.3 indicates for Alternative B that ex situ treatment is assumed for "273,440 to 364,590 cy of the dredge material" in intermediate areas only. However, Section 3.6.3 indicates that for the entire Alternative B "ex-situ treatment of 240,840 to 321,120 cy" will occur. How can the ex situ treatment in the intermediate portion of on an alternative be larger than the volume of ex situ treatment for the entire alternative?

k. Institutional controls are introduced for each technology. However, except under capping, this text mostly discusses issues related to Site-wide fish advisories that are not linked directly to any particular technology. Also, the text varies between these sections in unexplained ways. There is also a "common elements" discussion where institutional controls are discussed again in yet another slightly different way. As a result, the role of institutional controls as part of individual technologies and in the overall alternatives is generally unclear.

l. Many of the statements in the text are actually simplified assumptions that are not supported or are supported by citing just one reference (that may not actually support the statement in question). For example, EPA states, "Articulated fixed-arm dredges are the preferred dredging option due to the greater bucket control that can be achieved with this dredge type versus cable-operated dredges. This greater bucket control has proven to limit contaminant resuspension and release at other sediment sites (AMEC et al. 2012)." Anchor QEA disagrees that the reference noted provides sufficient information to suggest, much less prove, that articulated fixed-arm dredges do a significantly better job of limiting contaminant resuspension. The LWG disagree with EPA making major decisions about dredging methods based on one reference of questionable relevance and ignoring information from other recent projects (as presented in the 2012 draft FS). Further it is inappropriate to make such a statement about a particular dredging method, without acknowledging that actual construction means and methods should be determined during remedial design based on site- specific considerations and construction performance requirements set forth in remedial design documents.

m. EPA indicates that a review of chemical concentrations (particularly metals) across the Site indicated the potential for additional sediments to be classified as characteristic hazardous wastes based on the RCRA toxicity criteria. This review is not explained further. How was the review done? Is it the same as the review presented later in Section 4? What samples and locations exceeded RCRA toxicity criteria and for what chemicals? How did these determinations play into alternative development, given that the cost appendix does not indicate any additional ex situ treatment or disposal decisions related to RCRA hazardous waste?

n. EPA indicates that "maximum contaminant concentrations in sediment suitable for placement in the CDF were derived in the T4 60 Percent Design (Anchor QEA 2011), and are provided in Appendix D." However, Appendix D exclusively presents cap modeling methods and results used to identify PTW that is not reliably contained. Is EPA implying that this same modeling approach for the PTW evaluation was used to determine materials that can be placed in a CDF? If so, how do the cap modeling methods sufficiently mimic a CDF berm and containment design presented in the T4 60 percent Design?

o. EPA's technology decision trees contain references to "groundwater plume" areas. However, no map of the assumed groundwater plume areas is presented anywhere in Section 3. Consequently, it is impossible to determine where these decision points apply in the overall technology assignment approach. EPA indicated in the July 29, 2015 roll-out meeting that the RI groundwater information was used to define plume areas. As far as we are aware, the RI information does not indicate exact areas of each groundwater plume. Consequently, some intermediate steps remain unexplained that make the analysis impossible to reproduce.

p. EPA provides no back up data, appendix, or methods statements that describe how alternative durations and construction schedules were determined. A couple of pieces of information are provided regarding "productivity" including the number of days of dredging per season and that dredging is assumed to occur 24 hours a day and 6 days a week. EPA provided some additional production rate text on August 14, 2015, but this text does not address issues related to dredging efficiency (see Comment 5c), throughput time of the thermal desorption ex situ treatment plant, time allowed for sheetpile and other BMP installation and removal, time allowed for structure removal (which EPA indicates will happen for disused structures), how capping and other material placement activities are expected to occur, and construction sequencing details.

q. EPA indicates, "Estimates of shear stress throughout the Site are shown on Figure 3.3-18." The shear stress map is not very informative, because EPA compared these values to a critical shear stress value to identify erosional areas. A map of the resulting erosional areas should be presented. Without this information, the matrix scoring approach for erosional areas cannot be understood or reproduced. Also, Figure 3.3-18 incorrectly presents bed shear stress for the 25-year event, not the 2-year event as indicated.

r. As noted above in the discussion of the riverbank issue, the riverbank remediation approach appears to be very simplistic, but there is far too little detail to reproduce or even fully understand the approach, and there are major inconsistencies in the approach as described (see above discussion of regrading to 1.7V:1H versus 1V:5H slopes).

DO NOT QUOTE OR CITE This document is currently under review by US EPA and its federal, state and tribal partners and is subject to change in whole or in part.

s. Table 3.6-3 presents “import volumes,” which is specifically noted to include material for “Containment, Dredge Residuals Management, and In-Situ Treatment.” However, EPA’s technology decision trees also specify complete backfill of dredge prisms in a large proportion of the dredge areas. It is unclear whether these backfill volumes are included in EPA’s analysis or not. Given the different purpose of dredge backfill, these volumes should be called out separately.

t. Regarding PTW determinations, Table 3.3-7 notes that only chlorobenzene and naphthalene cannot be reliably contained. However, page 3-21 says PCBs and dioxins/furans can be reliably contained, but “an additional evaluation will need to be conducted on dredged sediment containing any PTW related to NAPL, PAHs or DDx. Thus, ex situ treatment is applied to dredged sediment and soil containing these contaminants.” The rationale for conducting a detailed PTW reliably contained analysis and then ignoring the results for NAPL, PAHs, and DDx is entirely unexplained. It is also unclear from the cost appendix whether EPA actually included areas above the PTW high-concentration threshold for PAHs and DDx as part of the ex situ treatment volumes or not.

u. EPA has never provided a description of or the actual FS database that was updated by EPA to incorporate new upland riverbank soils data from the DEQ source control program and newer data collected by the City at RM6E and by the RM11E Group and City at RM11E. If EPA added new data it is unclear whether established data quality review procedures were followed in updating the database. Consequently, it is not possible to check or reproduce certain data analysis steps such as mapping concentrations. If the newer data were not used by EPA, the LWG would like to know how EPA intends to use these data in development of the conceptual remedy and proposed plan.

Some examples of inconsistencies and missing information in Section 4 include:

a. Most of the references are missing.

b. Information referred to in appendices does not exist in some cases (e.g., additional residual risk figures purported to be in Appendix H are not present).

c. Costs from Table CS-ALT in Appendix G do not match the costs presented in Table 4.3-1 or Table 4.3-2.

d. The costs in Table 4.3-1 and 4.3-2 do not match each other.

e. The areas and volumes presented in Section 3 are not consistent with the areas and volumes presented in Table 4.3-1 in most cases.

f. The construction durations presented in Table 4.3-2 are consistent with those provided in Section 3.

g. The alternative maps included in Section 4 (Figures 4.2-11 and 4.2-14 through 4.2-17) match Figures 3.6-02 through 3.6-07 from Section 3, which are the figures that EPA indicated verbally during the August 13, 2015 conference call were incorrect.

h. As noted above, RCRA waste determinations on page 4-23 appear to conflict with determinations described in Section 3. Requirements for treatment of large areas of the Site indicated by figures cited on page 4-23 do not appear to be included in Section 3 quantities and, therefore, may not be included in Section 4 costs. It is unclear whether this is purposeful or not.

i. EPA indicates that Site-wide residual risk estimates were also made, but no Site-wide results are presented.

j. Page 4-6 indicates that "predicted concentrations in sediment at MNR Year 0 are used to estimate concentrations in fish and shellfish tissue." No estimates of tissue concentrations are subsequently presented.

k. Appendix H indicates, "Results of the risk reduction evaluation are presented in Section XX and Appendix YY." The references to other sections and appendices are incomplete and no additional appendix relevant to this subject appears to exist.

l. There are inconsistencies in the presentation of residual risks. For example, Section 4.2.2 regarding magnitude of residual risk for RAO 1 for Alternative B is given as "generally less than 5 x 10^{-5}," while Table 4.3-1 indicates risks for RAO 1 as "3 x 10^{-5}."

m. There are inconsistencies in dredge volumes given in the text and tables. Using Alternative B as an example, dredge volumes are given in Table 4.3-1 and Section 4.2.2.3 as 872,000 cy and in Section 4.2.2.6 as 462,000 cy. Additionally, Table 4.3-2 indicates 892,000 cy for disposal.

n. There are inconsistencies between capping volumes presented in the text and capping volumes listed in tables. Using Alternative B as an example, Section 4.2.2.3 states that "Various caps would be placed over 34 acres of the site," while Table 4.3-2 includes 7 acres of capping and 7 acres of in situ treatment.

o. Table 4.3-1 does not include any O&M costs. Costs associated with long-term O&M are given in Sections 4.2.1-4.2.6. For example, Section 4.2.2.7 states that long-term O&M for Alternative B is estimated to be $596,500,00 ($14,560,000 in present value) over an additional 70 years.

p. Section 4 introduces PRGs for dioxin/furan congeners that were not included in Section 2. The following PRGs are included in EPA's Table 4.2-1:

    i. HxCDF: Section 2 does not include a PRG for RAO 1 for this congener and three other congeners listed below. Section 2 presents only a 2,3,7,8-TCDD TEQ PRG for RAO 1. The HxCDF PRG in Table 4.2-1 happens to be equal to the TCDD PRG of 0.001µg/kg divided by the TEF but that does not appear to be the case for all congeners (e.g., PeCDF).

ii. EPA's August 18, 2015 Table 4.2-1 and related figures also present a PRG for RAO 2 for this congener of 0.001 µg/kg (denoted "background ND"). EPA's July 29, 2015 Section 2 presented an HxCDF PRG for RAO 2 of 0.000002 µg/kg. No background value was summarized in Section 2 for HxCDF, and therefore, it is unclear where this PRG came from.

iii. PeCDD, PeCDF, TCDF - Section 2 does not include a PRG for RAO 1 for these congeners. Section 2 presents only a 2,3,7,8-TCDD TEQ PRG for RAO 1. Evaluating the remedy effectiveness for alternatives using these PRGs is therefore inconsistent with Section 2.

iv. HxCDF RAO 6 PRG is inaccurately presented as being based on otter exposures in Table 4.2-1. Per EPA Section 2, the PRG of 0.003 µg/kg is based on Osprey (egg) per EPA Section 2.

q. The final page of Appendix H indicates that post-remediation SWACs for RAO 1 were evaluated on a rolling whole RM basis, which is not consistent with Figures 4.2-1a and b which present SWACs on a 0.5 RM basis.

r. The y axis label for the ecological residual risk figures presented in Section 4 may be misleading and should be clarified that the data represent HQs, rather than "risk".

DO NOT QUOTE OR CITE This document is currently under review by US EPA and its federal, state and tribal partners and is subject to change in whole or in part.

3 REFERENCES

AECOM. 2012. Final Feasibility Study, Lower Duwamish Waterway, Seattle, Washington. For submittal to the US. Environmental Protection Agency, Region 10. October 31, 2012.

Anchor QEA. 2013. Lower Willamette River Smallmouth Bass Data, Monitored Natural Recovery Analysis. Presentation to EPA, Region 10. March 18, 2013.

DEQ (Oregon Department of Environmental Quality). 2014. Portland Harbor Upland Source Control Summary Report. November 21, 2014.

EPA (U.S. Environmental Protection Agency). 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final. Office of Solid Waste and Emergency Response, Washington, D.C., EPA/540/G-89/004. OSWER Directive 9355.3-01. October 1988.

EPA. 1991. A Guide to Principal Threat and Low Level Wastes. Office of Solid Waste and Emergency Response. Superfund Publication 9380.03-06FS. Washington, D.C. November 1991.

EPA. 2000. A Guide to Developing and Documenting Cost Estimates During the Feasibility Study. USEPA 540-R-00-002 OSE 9355.0-75. July 2000.

EPA. 2002. Transmittal of Policy Statement: “Role of Background in the CERCLA Cleanup Program.” From Michael B. Cook, Director of Office of Emergency and Remedial Response to Superfund National Policy Managers Regions 1-10. OSWER 9285.6-07P. Washington, D.C. May 1, 2002.

EPA. 2005a. *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites.* EPA Office of Solid Waste and Emergency Response. §2.4.1 OSWER 9355.0-85. December 2005.

EPA. 2005b. Preliminary Close Out Report, McCormick and Baxter Creosoting Company Superfund Site. Portland, Oregon. September 2005.

EPA. 2013. Proposed Plan Lower Duwamish Waterway Superfund Site. USEPA, Region 10. February 28, 2013.

EPA. 2014. Record of Decision. Lower Duwamish Waterway Superfund Site. EPA, Region 10. November 2014.

ERDC (Engineer Research and Development Center, U.S. Army Corps of Engineers). 2015. ERDC website Dredge Material Disposal Management Models. Available from: http://el.erdc.usace.army.mil/products.cfm?Topic=model&Type=drgmat.

Hayter, E., K. Gustavson, S. Ells, J. Gailani, J. Wolfe, T. Dekker and T. Redder. 2014. Technical Guidelines on Performing a Sediment Erosion and Deposition Assessment (SEDA) at Superfund Sites. USACE, Washington, D.C., ERDC TR-14-9, September 2014.

LWG. 2014a. Draft LWG Suggestions for Revisions to EPA’s Technology Screening Approach. Memorandum date April 30, 2014.

LWG. 2014b. References Pertaining to Practical Slopes for Caps and EMNR. May 9, 2014.

LWG. 2014c. LWG Response to EPA's Principal Threat Waste Approach. August 7, 2014. Lower Willamette Group response submitted to EPA Region 10 on the Portland Harbor Superfund Site.

LWG. 2014d. LWG Comments on Revised FS Section 2 (Lower Willamette River, Portland Harbor Superfund Site, USEPA Docket No. CERCLA-10-2001-0240). Lower Willamette Group. June 19, 2014.

LWG. 2014e. Proposed Process for Incorporation of EPA's Dredge Production and Dredge Residual Recommendations for the Portland Harbor Feasibility Study. January 15, 2014.

LWG. 2014f. Draft LWG Response to EPA's Proposed Dredge Depth Approach for the Revised FS. July 9, 2014.

LWG. 2014g. Sediment Equilibrium Estimates for the Revised Feasibility Study. August 7, 2014.

LWG. 2015a. LWG Comments on Revised FS Section 2 (Lower Willamette River, Portland Harbor Superfund Site, USEPA Docket No. CERCLA-10-2001-0240). Lower Willamette Group. March 25, 2015.

LWG. 2015b. LWG Responses to EPA's Responses to LWG Comments on Feasibility Study Revised Draft FS Section 2 Text. Lower Willamette Group. April 23, 2015.

Palermo, M., Maynord, S., Miller, J., and Reible, D. 1998. Guidance for In-Situ Subaqueous Capping of Contaminated Sediments. EPA 905-B96-004, Great Lakes National Program Office.

DO NOT QUOTE OR CITE This document is currently under review by US EPA and its federal, state and tribal partners and is subject to change in whole or in part.